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MONOGRAPH OF THE NITSCHKIEAE

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(Continued from the January number)

2. **Calyculosphaeria** nom. nov.

Winterella Berl. Ic. Fung. **1**: 94. 1894. Not *Winterella* Kuntze, Rev. Gen. **2**: 34. 1891. Not *Winterella* Sacc. Syll. Fung. **14**: 620. 1899.

Winterina Sacc. *emend.* Syll. Fung. **14**: 589. 1899. Not *Winterina* Sacc. Syll. Fung. **9**: 909. 1891.

Type species, *Nitschkia tristis* Fuckel.

Perithecia black, coriaceous-carbonaceous, turbinate, collapsing to cupulate, scattered to densely gregarious, arising from a hyphoid subiculum of coarse, brownish-black, iridescent hyphae, or seated on a well-developed pseudoparenchymatous stroma, usually prominently tuberculate, in one species strigose, apically ostiolate; ostiolum obscure to papilliform; asci thin-walled, evanescent, 8-spored, clavate, tapering to a long thread-like stalk, in some species apically thickened; ascospores straight, fusiform to subcylindric, subbiseriate to crowded, hyaline, at maturity centrally 1-septate, sometimes appearing to be 3-septate due to the presence of guttulae separated by pseudosepta, in some cases slightly constricted.

The genus *Winterella* Berl. (**5**) was based on *Winteria tuberculifera* E. & E. Saccardo had previously used the name *Winterella* (**64**) for a subgenus of *Cryptospora* Tulasne, and Kuntze (**44**) elevated it to generic rank to replace *Cryptospora* Tulasne which is antedated by *Cryptospora* Karelin & Kirilow (1842), a genus of the Cruciferae. The name *Winterella* is, therefore, untenable for Berlese's genus.

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The genus *Winteria* Sacc. (**66**) is equivalent to *Hypocreopsis* Wint. (**86**), not Karst. (**37**), and is antedated by *Selinia* Karst. (**38**), a recognized genus of the Hypocreales. The name *Winteria* was later proposed by Rehm (**56**) for a subgenus of *Trematosphaeria*. He gave a subgeneric diagnosis, but employed the anomalous procedure of using the name in his binomials. Saccardo (**64**) gave the group generic rank, attributed it to Rehm, and incorporated it in the Hyalophragmiae of the Sphaeriaceae.

The genus *Winterina* Sacc. (**64**) was founded to include species differing from *Winteria* Rehm in the possession of muriformly septate spores, and embraced *W. crustosa* E. & E., *W. rhoina* E. & E., and *W. coerulea* E. & E. In *Winteria* as typical phragmosporic species Saccardo retained the type species *W. lichenoides* Rehm, *W. viridis* (Rehm) Sacc., *W. tuberculifera* E. & E., and others. Later, it having been demonstrated that *W. lichenoides* and *W. viridis* in reality possess muriform spores, Saccardo reversed his position and published *Winterina* Sacc. *emend.* to include the phragmosporic species. He excluded from the emended genus *W. coerulea* and included *W. tuberculifera* previously assigned to *Winteria*.

Later von Höhnel (**31**) in a critical revision of these genera found that the type species of the genus *Winteria, W. lichenoides* Rehm, as well as *W. viridis* Rehm, and *W. cembrincola* Rehm *in herb.* are lichens and fall in the genus *Microglaena*. The species *W. excellens* Rehm was found to be identical with *Odontotrema hemisphaericum*, and the other species of the genus were found to belong to widely separated genera. It is evident, therefore, that the generic name *Winteria* Rehm must be abandoned.

Although the genus *Winterina* Sacc. (1891) was founded to embrace muriform-spored species, only one of the three species included, *W. coerulea* E. & E., really has muriform spores. It should, therefore, be regarded as the type of the genus. Von Höhnel has shown that this species, *W. subcoerulescens, W. acuminans, W. intermedia*, and *W. laricina* are all identical. He has erected a new genus, *Mycoglaena*, to include the single species, *M. subcoerulescens* (Nyl.) v. Höhn. The generic name *Winterina* might better have been retained for it, especially since the

other two species included in *Winterina* have been shown by von Höhnel to lack muriform spores and to belong to *Leptosporella*. The name *Winterina* can not in any case be recognized for the emended genus of Saccardo, since it was applied earlier to another group.

The species *Winteria tuberculifera* E. & E. is the type of both *Winterina* Sacc. *emend.* and *Winterella* Berl. As originally described by Ellis (**19**) the spores are said to be "hyaline, 2–4-nucleate (becoming 1–3-septate ?)." The writer has examined them, however, under the best lenses and finds that only a single central septum is formed. The presence of large guttulae sometimes causes the appearance of additional pseudosepta. The species is, therefore, not phragmosporic. The writer finds it to be identical with *Nitschkia tristis* Fuckel.

Von Höhnel (**35**) in a revision of the allantoid-spored Sphaeriaceae calls attention to the fact that in many of the species included in the genus *Nitschkia* the spores are in reality straight rather than allantoid, and often appear 2-celled. A comparison of the spores of several of these species with those of *W. tuberculifera* led him to conclude that the genus *Nitschkia* is identical with *Winteria* Sacc. *emend.* Later (**36**) he discovered that the spores in *N. cupularis* are actually allantoid as originally described, and he reversed his decision and recognized *Nitschkia* and *Winterina* as separate genera, the latter having straight, uniseptate spores. In the present account two genera are recognized, but since the names *Winterina* and *Winterella* are untenable it has been necessary to select a new generic name.

KEY TO THE SPECIES OF CALYCULOSPHAERIA

A. Ascospores less than 12 μ in length.

1. Perithecium tuberculate, ostiolum obscure.

a. Perithecium strikingly tuberculate with large warts, not prominently stipitate. 1. *C. tristis* (Figs. 6, 25, 34).

b. Perithecium more minutely tuberculate, strikingly stipitate. 2. *C. calyculus.*

2. Perithecium strigose, ostiolum very evident. 3. *C. pezizoidea* (Figs. 7, 24).

B. Ascospores 12 μ or more in length.

1. Ascospores 12–17 × 3.5–7 μ, fusiform. 4. *C. collapsa* (Figs. 5, 22, 23).

2. Ascospores 36–45 × 12–14 μ, subfusiform to subcylindric, prominently constricted. 5. *C. macrospora* (Figs. 8, 21, 38).

1. **Calyculosphaeria tristis** (Fuckel) comb. nov.

?*Sphaeria tristis* Pers. Ic. Descr. Fung. **2**: 49. 1800. Not *S. tristis* Tode, Fungi Meckl. **2**: 9. *pl. 9, fig. 67 a–c.* 1791, which is the same as *S. phaeostroma* Dur. & Mont., and a *Chaetosphaeria.*

Nitschkia tristis Fuckel, Symb. Myc. 165. 1869.

Coelosphaeria tristis Sacc. Syll. Fung. **1**: 92. 1882.

Melanopsamma Grevillii Rehm, in Starbäck, Bih. Sv. Vet.-Akad. Handl. **16(3)**[3]: 5. *pl. 1, fig. 1 a, b.* 1890.

Winteria tuberculifera E. & E. Proc. Acad. Phila. **1890**: 240. 1890.

Winterella tuberculifera (E. & E.) Berl. Ic. Fung. **1**: 94. 1892. (Incorrectly spelled *tuberculigera.*)

Winterina tuberculifera (E. & E.) Sacc. Syll. Fung. **14**: 589. 1899.

Nitschkia Winteriana Sacc. Mem. Accad. Sci. Padova **33**: 159. 1917.

Winterina tristis v. Höhn, Ann. Myc. **16**: 105. 1918.

ILLUSTRATIONS: Pers. Ic. Descr. **2**: *pl. 12, figs. 5, 6;* Bih. Sv. Vet.-Akad. Handl. **16(3)**[3]: *pl. 1, fig. 1 a, b.* 1890.

(Figures 6, 25, 34)

Hyphoid subiculum profusely developed to scanty, composed of brownish-black threads, 7–9 μ in diameter, and of characteristic metallic iridescence; perithecia subcespitose or densely gregarious to scattered, forming black patches frequently several centimeters in diameter on the surface of the bark or decorticated wood, sometimes fringing crevices in the bark and appearing erumpent, variable in size, 360–750 μ (mostly 400–500 μ) in diameter, black, usually dull, glabrous, not strigose, strikingly tuberculate with large warts which in some collections measure 75–90 μ in diameter, in other cases less coarsely roughened, turbinate, finally apically depressed and collapsing to cupulate; the flattened apex not centrally papillate; ostiolum obscure; asci clavate, 8-spored, 16–35 x 5–7 μ (p. sp.), thin-walled except for a thickened apex, evanescent, tapering to a long thread-like base; spores not allantoid, straight, subcylindric to fusoid, hyaline, subbiseriate to crowded, 5–10 x 1.5–2.5 μ (mostly 6–8 x 2 μ), frequently bi- or quadriguttulate, at maturity 1-septate.

The original description (Tode **85**) of *Sphaeria tristis* Tode is accompanied by figures illustrating crudely the perithecium and habit of growth. Fuckel (**27**) states that the species is identical with *S. phaeostroma* Dur. & Mont. and includes it in the genus *Chaetosphaeria*. He cites exsiccati specimens[11] and figures the spores. The species, as understood by Fuckel, possesses spheric, black perithecia seated on or partially buried in a prominent byssus from which arise numerous erect spines. The spores are 4-celled, the terminal cells hyaline, the central ones brown. The species is mentioned in recent literature as *Chaetosphaeria phaeostroma* (Dur. & Mont.) Fuckel or *C. tristis* (Tode) Schröt.

Persoon (**54, 55**) states in his description of *S. tristis* that he is in doubt whether his species is identical with that of Tode. He says that in his material the perithecia collapse to cupulate, and form an extensive crust over a hyphoid subiculum. A comparison of his illustrations with those of Tode indicates that the species are not the same, but the identification of either from the original descriptions is impossible. Fuckel regarded his species, *Nitschkia tristis* Fuckel, as identical with *S. tristis* Pers. and states that the species differs generically from *S. tristis* Tode. He does not say, however, that he saw the type material of either of these species. He cites exsiccati specimens[12] to illustrate *N. tristis* and figures an ascus and spores, the latter being shown as hyaline, allantoid, unicellular, and triguttulate. An examination of the two specimens cited, as represented in the herbarium at Harvard University, reveals the fact that they are not the same. Moreover, neither one can be said to agree fully with Fuckel's description and illustrations. The fungus in Fuckel, Fungi Rhenani *947*, is identical with that in Rabenhorst, Fungi Europaei *51*, and is, therefore, *Chaetosphaeria*. The citation of this specimen is an evident error. The material in Rabenhorst, Fungi Europaei *632*, agrees with the description given by Fuckel except that the spores are straight rather than allantoid and not constantly triguttulate. Examination of a specimen from the herbarium of Fuckel[13] at Harvard labelled *Coelosphaeria tristis* Sacc. shows material identical with that dis-

[11] Fuckel, Fungi Rhen. *2040* and Rab. Fungi Eur. *51*.
[12] Rab. Fungi Eur. *632*, and Fuckel, Fungi Rhen. *947*.
[13] Herb. Barbey-Boiss. *590*.

tributed by Rabenhorst, and since in these specimens the spores agree in size with the measurements given by Fuckel it seems logical to accept this material as authentic for his species, and to explain his statement that the spores are allantoid as due to faulty observation. Since type material of *S. tristis* Pers. is unavailable it seems best to base our concept of *Nitschkia tristis* Fuckel on Rabenhorst, Fungi Europaei *632*. Considerable misunderstanding has existed with reference to the identity of the species. The description and figures given by Berlese (**5**) seem to be based at least in part on material of *Sphaeria cupularis* Fries. Chentantais (**11**) calls attention to the state of uncertainty concerning the species and concludes that it is identical with *N. cupularis*.

Von Höhnel (**36**), basing his opinion on an examination of Rabenhorst, Fungi Europaei *632*, states that the spores in *N. tristis* are cylindric to fusiform, usually straight, 2-celled, and quadriguttulate. Winter (**89**) gave a diagnosis of the species based on a study of the same collection, but failed to note a septum in the spore. Von Höhnel emphasized the 2-celled character and transferred the species to the genus *Winterina*.

A comparison of the material in Rabenhorst, Fungi Europaei *632*, with specimens from the type collections of *Winteria tuberculifera* E. & E. and *Melanopsamma Grevillii* Rehm shows the three collections to be the same.

Although the type material of *N. Winteriana* Sacc. has not been studied, the species is regarded as identical with *N. tristis*. The author states that it is equivalent to the latter species as understood by Winter, and Winter bases his description on Rabenhorst, Fungi Europaei *632*.

MATERIAL EXAMINED

Rab. Fungi Eur. *632* (at Cornell Univ., Harvard Univ., and N. Y. Bot. Gard.).

Herb. Barbey-Boiss. *590, ex Herb.* Fuckel (at Harvard Univ.).

Vize, Micro-fungi Brit. *391* (at Harvard Univ.).

Rehm Herb., Mus. Bot. Stockholm, type material of *Melanopsamma Grevillii* Rehm sent for examination.

Ellis Herb. ex Dearness Herb. *1533*, type material of *Winteria tuberculifera* E. & E. (at N. Y. Bot. Gard.; also seen in Everhart Herb. & Gen. Herb. at Harvard Univ.).

Fitzpatrick Herb. *1531*, collected near Ithaca, New York, by H. Fitzpatrick; *1371*, collected at Ocala, Florida, by R. Thaxter; *1895*, collected at Daytona, Florida, by R. Thaxter; *1897*, collected at Maraval Valley, Trinidad, by R. Thaxter; *1900*, collected at St. Ann's Valley, Port of Spain, Trinidad, by R. Thaxter. (Material of each of these collections also deposited in Herb. R. Thaxter at Cambridge, Massachusetts.)

2. **Calyculosphaeria calyculus** (Mont.) comb. nov.

Sphaeria (*Caespitosa*) *calyculus* Mont. Ann. Sci. Nat. II. **14**: 322. 1840.

Sphaeria calyculus Mont. Syll. Crypt. 226. 1856.

Byssosphaeria calyculus (Mont.) Cooke, Grevillea **15**: 122. 1887.

Coelosphaeria (?) *calyculus* (Mont.) Sacc. Syll. Fung. **9**: 444. 1891.

Nitschkia calyculus (Mont.) Kuntze, Rev. Gen. 3^2: 501. 1898.

Winterina calyculus (Mont.) v. Höhn. Ann. Myc. **16**: 127. 1918.

ILLUSTRATIONS: Ann. Sci. Nat. II. **14**: *pl. 19, fig. 2;* Berl. Ic. Fung. **3**: *pl. 28.*

TYPE: In Herb. Mus. Paris. Leprieur *372.*

Subiculum of stiff black threads, perithecia gregarious over large areas or rarely cespitose, turbinate, short stipitate, $\frac{1}{3}$–$\frac{1}{2}$ mm. diam., rugose, collapsing to cupulate; asci clavate, 18–22 x 7–9 μ; spores fusoid, straight, 5–6 x 2–2.5 μ, hyaline, often biguttulate, becoming uniseptate.

The description has been prepared from the original diagnosis of Montagne and the description and figures of Berlese who examined the type collection. The writer has not seen material of the species, but there seems to be no basis for excluding it from the genus.

3. **Calyculosphaeria pezizoidea** (Pat. & Gaill.) comb. nov.

Coelosphaeria pezizoidea Pat. & Gaill. Bull. Soc. Myc. Fr. **4**: 106. 1889.

Nitschkia pezizoidea Kuntze, Rev. Gen. 3^2: 501. 1898.

Winterina pezizoidea v. Höhn. Ann. Myc. **16**: 105. 1918.

TYPE: In Herb. Gaill. *266:* a portion of the original collection in Herb. Mus. Paris sent for study by Patouillard.

(Figures 7, 24)

Hyphoid subiculum well developed but thin, formed of brownish-black threads, 7–8 μ in diameter, of pronounced metallic iridescence, and chiefly tightly appressed to the bark; perithecia very characteristic, turbinate, scattered to gregarious, 350–425 μ in diameter, black, not tuberculate, more or less strigose, collapsing to deeply cupulate, the papilliform ostiolum strikingly evident in the center of the cup; asci 8-spored, clavate, approximately 40 x 6–8 μ (p. sp.); spores hyaline, straight, fusoid to ovoid, at maturity with a single median septum, occasionally appearing constricted, 7–10 x 2–3 μ.

The species was collected by Gaillard at San Fernando, Venezuela, in September, 1887, on decaying bark, and is known only from the type collection.

4. **Calyculosphaeria collapsa** (Romell) comb. nov.

Bertia collapsa Romell, Bot. Not. **1889**: 24. 1889.
Herpotrichia collapsa Rehm, Hedwigia **42**: 176. 1903.
Trichosphaeria vagans Boud. Ic. Myc. 1: 2. 1904; *pl. 574*. 1910.
Nitschkia collapsa Chentantais, Bull. Soc. Myc. Fr. **34**: 47–73. 1918.

ILLUSTRATION: Boud. Ic. Myc. *pl. 574*.

TYPE: Romell, Fungi Scand. Exsic. *70*.

(Figures 5, 22, 23)

Hyphoid subiculum profusely developed to scanty, composed of dark-brown threads, 6–7 μ in diameter, sometimes lacking or uniting with the elements of the substratum to form a thin, black pseudostroma; perithecia scattered to densely gregarious, forming black patches on the bark, large, 450–750 μ in diameter, the cupulate character plainly evident to the naked eye, black, prominently tuberculate though less coarsely so than in *C. tristis*, turbinate, the rounded apex centrally and prominently papillate, collapsing to cupulate, the papilliform ostiolum then very evident at the center of the cup; asci narrow clavate, 8-spored, 40–70 x 9–12 μ (p. sp.), thin-walled except for the thickened apex, tapering to a thread-like stalk; spores straight, fusiform, hyaline, subbiseriate, 1-septate, 12–17 x 3.5–7 μ.

The relatively small number of collections of material examined probably fails to give us a broad conception of this species. The

spores vary considerably in size in the different specimens, but are similar in other respects, and the perithecia in the four collections are indistinguishable. The septation of the spores has been previously noted by Romell (**62**) and Chentantais (**11**). The fact that the species is not a *Bertia* was first noted by Starbäck (**80**), who recognized its affinities with the genus *Tympanopsis*.

MATERIAL EXAMINED

Romell, Fungi Scand. Exsic. *70*, type material of *Bertia collapsa* Romell (at Harvard Univ.).

Herb. W. R. Gerard; specimen collected by Plowright in 1873, labelled *Sphaeria tristis* Tode (at N. Y. Bot. Gard.).

Herb. N. Y. Bot. Gard. *445*, *482* (collected by G. H. Cunningham, Lake Papaetonga, Wellington, New Zealand, August 18, 1919); material deposited in Fitzpatrick Herb. as *2011* and *2012* respectively.

5. **Calyculosphaeria macrospora** sp. nov.

TYPE: In Herb. R. Thaxter, Cambridge, Massachusetts, collected by R. Thaxter, January, 1898, at Daytona, Florida (portion of type collection deposited in Fitzpatrick Herb. as *1893*).

(Figures 8, 21, 38)

Perithecia large, 500–600 μ in diameter, rugose with large, irregular warts, black, glabrous, shiny, scattered to gregarious, turbinate, collapsing apically but due to the extreme roughness of the wall not becoming definitely cupulate, ostiolum obscure, sometimes visible before collapse, the bases of neighboring individuals forming a definite pseudoparenchymatous stroma; asci clavate, thin-walled, tip not thickened, aparaphysate, tapering to a slender stalk, 8-spored, 110–155 x 35–40 μ (p. sp.); spores very large, straight, cylindric, hyaline, 2-celled, constricted at the septum, 36–45 x 12–14 μ, with rounded ends.

On bark of unknown tree. Known only from the type collection.

3. TYMPANOPSIS Starbäck, Bih. Sv. Vet.-Akad. Handl. 19(3)^2: 24–26. *pl. 1, fig. 12 a–d.* 1894

Type species, *Sphaeria euomphala* B. & C.

Stroma absent; perithecia superficial, seated on or partially buried in a hyphoid subiculum; hyphae composing the subiculum brownish-black, with a beautiful metallic iridescence, abundantly branched, sinuous, as viewed under the compound microscope yellowish-brown to nearly opaque, supplied at regular intervals with thick septa; perithecia subspheric to turbinate, rounded above, obscurely ostiolate, collapsing to cupulate, scattered to densely gregarious, black, glabrous, minutely roughened or tuberculate, coriaceous-membranaceous to coriaceous-carbonaceous; asci broadly clavate to cylindric, 8-spored, aparaphysate; spores uniseriate to crowded, smoky-hyaline to yellowish-brown, smooth or minutely echinulate, ovoid to ellipsoid.

This genus is closely related to *Nitschkia* Otth, differing from it chiefly in the possession of colored spores.

KEY TO THE SPECIES OF TYMPANOPSIS

A. Ascus broadly clavate, spores crowded. 1. *T. euomphala* (Figs. 16, 27).
B. Ascus cylindric or clavate-cylindric, spores uniseriate or nearly so.
1. Perithecia more than 400 μ in diameter, spores large, 18–20 x 10–12 μ, smooth. 2. *T. coelosphaerioides.*
2. Perithecia less than 400 μ in diameter, spores small, 7–9 x 4.5–5 μ, minutely echinulate. 3. *T. uniseriata* (Figs. 17, 26, 28).

1. TYMPANOPSIS EUOMPHALA (B. & C.) Starbäck, Bih. Sv. Vet.-Akad. Handl. **19**(3)[2]: 24–26. *pl. 1, fig. 12 a–d.* 1894

? *Sphaeria conferta* Schw. Syn. Fung. Carolinae superioris 45. 1822, and in Fries, Syst. Myc. **2**: 444. 1823, not *S. conferta* Fries, Syst. Myc. **2**: 435. 1823, and in Schw. Syn. Fung. Am. Boreali 209. 1832.

? *Sphaeria confertula* Schw. Syn. Fung. Am. Boreali 211. 1832.

Sphaeria euomphala B. & C. Grevillea **4**: 141. 1876.

Botryosphaeria euomphala Sacc. Syll. Fung. **1**: 462. 1882.

? *Byssosphaeria* (*Amphisphaeria*) *conferta* Cooke, Grevillea **15**: 81. 1887.

Byssosphaeria euomphala (B. & C.) Cooke, Grevillea **15**: 122. 1887.

Sphaeria craterella B. & Rav. in Cooke, Grevillea **15**: 122. 1887.

Sphaeria introflexa B. & Rav. in Herb. Curtis.

? *Amphisphaeria conferta* (Schw.) Sacc. Syll. Fung. **9**: 747. 1891.

Nitschkia euomphala (B. & C.) E. & E. N. Am. Pyren. 246. 1892.

?*Coelosphaeria Beccariana* Berl. & Pegl. Nuovo Giorn. Bot. Ital. **24**: 110. *pl. 7, fig. 3.* 1892.

Tympanopsis exomphala (B. & C.) Starbäck, Bih. Sv. Vet.-Akad. Handl. **19**(3)^2: 24–26. *pl. 1, fig. 12 a–d.* 1894.

?*Trematosphaeria confertula* Ellis, Proc. Acad. Phila. **1895**: 25. 1895.

?*Nitschkia Beccariana* Kuntze, Rev. Gen. Plant. **3**^{2}: 501. 1898.

?*Tympanopsis Beccariana* v. Höhn. Ann. Myc. **16**: 105. 1918.

ILLUSTRATIONS: Berl. & Pegl. Nuovo Giorn. Bot. Ital. **24**: *pl. 7, fig. 3;* Berl. Ic. Fung. **3**: *pl. 26, fig. 2;* Starbäck, Bih. Sv. Vet.-Akad. Handl. **19**(3)^2: *pl. 1, fig. 12 a–d.*

(Figures 16, 27)

Hyphae of the subiculum forming a thin, appressed, rather inconspicuous network of indefinite extent, often covering the surface of the bark of decorticated wood to a distance of several centimeters; perithecia superficial on the subiculum, attached to it by prominent basal hairs, at its center densely gregarious but toward its rather indefinite margin becoming widely scattered, varying considerably in size, 280–500 μ in diameter, minutely roughened with definite tubercles, black, glabrous, collapsing to deeply cupulate; the ostiolum not evidently papillate, obscure; asci broadly clavate, thin-walled, evanescent, 20–25 x 9–11 μ (p. sp.), 8-spored, aparaphysate, tapering into a long, thread-like stalk; spores crowded, especially above, ovoid to ellipsoid, occasionally more narrowed toward one end, frequently flattened on one side or even concave so that a few spores seem slightly curved, 7–9 x 4–5 μ, frequently biguttulate and then sometimes appearing pseudoseptate, smoky-hyaline or darker, in mass yellowish-brown.

Schweinitz (**73**) described *Sphaeria conferta* from material collected on bark of the spice bush (*Lindera Benzoin*) at Salem, North Carolina. Fries (**25**) included the species in Systema Mycologicum, referring by number to the description of Schweinitz, but unfortunately applied the same binomial earlier in the volume to a wholly different fungus occurring on leaves. Schweinitz (**74**), having noted this duplication, changed the name of his own species to *Sphaeria confertula*, and retained the name *S. conferta* for the fungus described by Fries from leaves.

Sphaeria conferta Fries, as represented in the Schweinitz her-

barium, is, according to Ellis (**20**) and Farlow (**22**), immature *Sphaerella maculiformis*. *Sphaeria conferta* Schw. (**73**) has been the subject of considerable controversy, and the question of its identity with *S. cuomphala* B. & C. has been raised. Cooke (**14**) examined a specimen in the herbarium of Berkeley labelled *S. conferta* Schw., and describes the spores as 2-celled, brown, and constricted. On the basis of his observations Saccardo (**64**) and Ellis (**20**) list the species in the genus *Amphisphaeria*. Starbäck (**80**) examined a Schweinitzian specimen in the herbarium of Fries and, though failing to find asci or spores, calls attention to its marked similarity in external aspect to *S. cuomphala*. Ellis (**18**) examined a specimen in the herbarium of Schweinitz labelled *S. confertula*, found asci containing brown 3-septate spores, and describes the species as *Trematosphaeria confertula* (Schw.) Ellis. The material examined was collected at Bethlehem, Pennsylvania, on rotten wood and Ellis expresses doubt as to its identity with the North Carolina specimen on which Schweinitz founded *S. conferta*. Farlow (**22**) examined a Schweinitzian specimen of *S. conferta* from Salem, North Carolina, in the herbarium of Curtis, saw two sorts of spores, concluded from a review of the literature that an understanding of the species is hopeless, and recommends that it be placed permanently under *species ignotae*. He states, however, that the external resemblance to *S. cuomphala* is marked.

The herbarium of Schweinitz contains a specimen labelled in his own handwriting "*Sphaeria confertula* L. v. S. Salem" which may reasonably be regarded as the type of the species. It is the same as the Schweinitzian specimen in the herbarium of Curtis, but is less fragmentary. Although the perithecia are not definitely cupulate, they agree well in size, shape, and surface characters with the uncollapsed individuals of *S. cuomphala*. The spores are identical in the two cases, as are also the hyphae of the subiculum. Failure to find asci in the Schweinitzian specimens alone deters the writer from stating unqualifiedly that the species are the same.

Coelosphaeria Beccariana Berl. & Pegl. apparently also belongs here. The species is not represented in the herbarium of Saccardo, and no authentic material has been available to the writer. As described and figured (**5**) it agrees, however, fully with the

older species. It is noteworthy that the authors of the species fail to call attention to *S. cuomphala* in their discussion of its relationships.

MATERIAL EXAMINED

Rav. Fungi Car. **4**: *54* (at N. Y. Bot. Gard., Harvard Univ., Missouri Bot. Gard., and Phila. Acad. Sci.).

Ellis Herb. N. Y. Bot. Gard. (*976, 1057, 1186*, all *ex Herb.* Morgan, the first labelled *Nitschkia tristis*, the others *Nitschkia cuomphala*).

Schw. Herb. Phila. Acad. Sci. (*1508* labelled "*Sphaeria confertula* L. v. S. Salem"); (*1477* labelled *Sphaeria conferta* Fries, material collected at Bethlehem on leaves, very different from *1508* and not resembling *Tympanopsis*).

Curtis Herb. Harvard Univ. (*363 ex Herb.* Schw. same as *1508* in Herb. Schw.); (*1550, type* material of *Sphaeria cuomphala* B. & C., *ex Herb.* Rav. *441*); (*1307 ex Herb.* Rav. *type* material of *S. cuomphala*, labelled here *S. craterella* B. & C., and a second specimen bearing this number labelled *S. introflexa* B. & Rav.); (*865 ex Herb.* Peters, labelled *S. cuomphala* B. & C.).

2. TYMPANOPSIS COELOSPHAERIOIDES Penz. & Sacc. Malpighia **11**: 394. 1897

ILLUSTRATION: Penz. & Sacc. Ic. Jav. *pl. 6, fig. 3.*

"*Peritheciis gregariis v. hinc inde in soros subaggregatis, superficialibus, carbonaceo-molliusculis, e globoso mox collabascendo concavo-patellaribus, minutissime rugulosis, nigris, 0.5–0.8 mm. diam., ostiolo vix manifesto, contextu grosse celluloso, fuligineo; ascis tereti-clavatis, apice rotundatis, breve stipitatis, 75–90 x 15–18, aparaphysatis, 8-sporis; sporidiis mono—v. distichis, ellipsoideis, 18–20 x 10–12, fuligineis.*

"*Hab. in corticibus, Depok. 4 I 97 (n. 207).—Secunda pulcri generis Starbackiani species.*"

It has not been possible to obtain material of this species for study. It is incorporated here because examination of the published description and figures reveals no character warranting its exclusion.

3. **Tympanopsis uniseriata** sp. nov.

TYPE: In Herb. R. Thaxter at Harvard Univ. (portion of the type collection deposited in Fitzpatrick Herb. as *1904*).

(Figures 17, 26, 28)

Subiculum prominent as a thin, flat, mycelial mat, covering areas several centimeters in diameter on the surface of the bark, margin not sharply delimited; hyphae 7–9 μ in diameter, profusely branched, procumbent on the substratum but also definitely aërial and abundantly provided with stiff, more or less erect branches which form a dense barricade and simulate spines; perithecia scattered to gregarious, partially embedded in the subiculum, attached to it by basal hairs, varying considerably in size, 200–350 μ in diameter, black, glabrous, shiny, prominently though minutely roughened, collapsing to cupulate; the rim of the cup rather thick; the ostiolum not evidently papillate, obscure; asci cylindric, 60–70 x 8–10 μ (p. sp.), 8-spored, aparaphysate, thin-walled; spores definitely uniseriate, not overlapping, variously oriented, frequently transverse, broadly ovoid to ellipsoid, occasionally more narrowed toward one end, 7–9 x 4.5–5 μ, frequently biguttulate and then sometimes pseudoseptate, smoky-hyaline to light-yellowish-brown, minutely echinulate; the echinulations more readily discernible on young, hyaline spores.

On the bark of unknown trees at Cocoanut Grove and Cutler, Florida.

In the possession of spiny spores the species differs strikingly from other members of this genus, and the erection on it of a new genus could perhaps be justified.

MATERIAL EXAMINED

Herb. R. Thaxter at Harvard Univ. *type*, collected by R. Thaxter at Cocoanut Grove, Florida, December 1897 (portion of type collection deposited as *1904* in Herb. Fitzpatrick); another collection made by R. Thaxter at Cutler, Florida, December 1897 (portion deposited as *1892* in Herb. Fitzpatrick).

4. THAXTERIA Sacc. Syll. Fung. 9: 687. 1891

Bizozzeria Speg. Fungi Puiggariani, Bol. Acad. Nac. Ci. Cordoba 11: 519. 1889. Not *Bizozzeria* Sacc. Atti Istit. Veneto Sci. VI. 3: 739. 1885.

Type species, *Coelosphaeria leptosporoides* Wint.

Perithecia superficial, scattered to densely crowded, turbinate to clavate, coriaceous-carbonaceous, ostiolate, the terminal broadened portion containing the subspheric, ascigerous cavity, the lower or stalked portion solid, and frequently fused with the bases of neighboring individuals forming a definite pseudoparenchymatous stroma, at maturity or on drying collapsing to cupulate or laterally shrunken; asci thin-walled, slender-clavate, very long-stipitate, 8-spored; spores broadly allantoid, remaining hyaline for a long time, finally 4-celled by transverse septa and dark brown.

The genus *Bizozzeria* Speg. (**76**) was based on the single species, *B. didyma* Speg. In the generic diagnosis Spegazzini states that the spores are grayish-green and uniseptate. Saccardo (**67**) had applied the name *Bizozzeria* previously to another group, and substitutes the name *Thaxteria* Sacc. (**64**) for Spegazzini's genus. His description is merely copied from that of Spegazzini, and he evidently did not study material. Lindau (**45**) and others have since been content to follow Saccardo.

Through the courtesy of Professor Spegazzini the writer has been enabled to examine the original collection of *B. didyma*, and has found that the spores at maturity are dark-brown and 4-celled by transverse septa. They agree strikingly with the spores of *Leptospora spermoides* var. *rugulosa* Rick, and these two species are clearly congeneric. Moreover, a comparison of the perithecia and spores of the last-named species with those of *Coelosphaeria leptosporoides* Wint. convinces the writer that these two species are identical, and should bear the name *Thaxteria leptosporoides* (Wint.) comb. nov.

Von Höhnel (**32**) noted the similarity of *Leptospora spermoides* var. *rugulosa* Rick to members of the genus *Nitschkia*, and incorporated the species in this genus, stating that this fungus is in reality not a variety of *L. spermoides* (Hoffm.) Fuckel. Later he (**36**) reversed his decision, included the variety in the parent species, and incorporated the species in the genus *Thaxteria* as *T. spermoides* (Hoffm.) v. Höhn. He also placed in *Thaxteria* three species of *Lasiosphaeria*, *L. solaris* (C. & E.) Sacc., *L. sublanosa* (Cooke) Berl., and *L. pseudobombarda* (Mont.) Berl. He is clearly in error in regarding *Leptospora spermoides* var. *rugulosa* Rick as a variety of *L. spermoides* (Hoffm.) Fuckel. Examina-

tion of material[14] of the parent species shows it to differ from the variety markedly in spore and perithecial characters, these being well illustrated by Berlese (**5**). Moreover, the three species of *Lasiosphaeria* are wholly unlike *Thaxteria*. Von Höhnel failed to note the fact that the spores of *Leptospora spermoides* var. *rugulosa* Rick finally become brown and 3-septate, even though the point was called to attention by Rick (**61**). Moreover, he (**36**) transfers *Coelosphaeria leptosporoides* Wint. to the genus *Leptosporella*.

KEY TO THE SPECIES OF THAXTERIA

A. Perithecia broadly turbinate, coarsely tuberculate, collapsing to cupulate. 1. *T. leptosporoides* (Figs. 9, 30, 31).

B. Perithecia clavate to narrow-turbinate, not tuberculate, collapse usually lateral. 2. *T. didyma* (Figs. 10, 32, 33, 35).

1. **Thaxteria leptosporoides** (Wint.) comb. nov.

Coelosphaeria leptosporoides Wint. Hedwigia **22**: 2. 1883.

Leptospora spermoides (Hoffm.) Fuckel var. *rugulosa* Rick, Ann. Myc. **3**: 17. 1905.

Nitschkia rugulosa (Rick) v. Höhn. Sitzungsber. K. Akad. Wiss. Wien **123**: 58, 59. 1914.

Leptosporella leptosporoides (Wint.) v. Höhn. Ann. Myc. **16**: 105. 1918.

TYPE: *Coelosphaeria leptosporoides* Wint. in Herb. Wint. at Berlin. (Material sent for the writer's examination.)

(Figures 9, 30, 31)

Perithecia broadly turbinate, 500–800 μ in diameter, black, shiny, very coarsely tuberculate, the individual tuberculations 50–100 μ in diameter, and prominently protruding, in age or on weathering tending to become brownish and slightly strigose, usually collapsing apically to definitely cupulate, more rarely laterally shrunken, the papilliform ostiolum much smaller than a single tuberculation but distinct; asci clavate, thin-walled, 75–95 x 14–17 μ (p. sp.), long-stipitate, 8-spored; spores broadly allantoid, often slightly more sharply curved at one end, for a long time remaining hyaline and unicellular, then 1-septate, and finally 4-celled by transverse septa and dark-brown, 20–30 x 6–7.5 μ.

[14] Rab. Fungi Eur. *2430*.

MATERIAL EXAMINED

Herb. Wint. Berlin (*type* collection of *Coelosphaeria leptosporoides* Wint.).

Herb. Fitzpatrick *1992* (collected by C. E. Chardon, Maricao, Porto Rico).

Rick, Fungi austro-americani **2**: *41* (at Harvard Univ.).

2. THAXTERIA DIDYMA (Speg.) Sacc. Syll. Fung. **9**: 687. 1891

Bizozzeria didyma Speg. Bol. Acad. Nac. Ci. Cordoba **11**: 519. 1889.

TYPE: *Bizozzeria didyma* Speg. in Herb. Speg. Argentina. (Material sent for the writer's examination.)

(Figures 10, 32, 33, 35)

Perithecia clavate to slender-turbinate, 400–700 μ in diameter, black, not prominently tuberculate, the surface in age becoming brownish and fibrillose, ostiolate, the conical papilla small but evident, usually collapsing laterally, more rarely depressed apically but usually not becoming characteristically cupulate; asci as in the preceding species; spores differing in being slightly shorter, 20–25 x 6–7.5 μ.

This species known only from the type collection is perhaps identical with the preceding. However, until material of an intermediate character is found, it does not seem wise to unite them.

MATERIAL EXAMINED

Herb. Speg. Argentina (*type* collection of *Bizozzeria didyma* Speg.).

5. ACANTHONITSCHKEA Speg. Anal. Museo Nac. Buenos Aires III. **10**: 116, 117. *1 fig.* 1908

Type species, *Acanthonitschkea argentinensis* Speg.

Stroma absent; perithecia superficial, seated on a hyphoid subiculum; hyphae composing the subiculum brownish-black, with a beautiful metallic iridescence, abundantly branched, sinuous, densely entangled, as viewed under the compound microscope yellowish-brown to nearly opaque, supplied at regular intervals with thick septa, armed with prominent spines which point in many directions and form a dense barricade; spines rigid, straight, or

slightly sinuous, unbranched, non-septate, opaque, cylindric, tapering to the sharp-pointed apex, brownish-black to black, shiny, strikingly iridescent; perithecia turbinate, rounded above, ostiolate, collapsing to cupulate, scattered to densely gregarious, brownish to black, armed with spines similar to those on the mycelium, coriaceous-membranaceous to coriaceous-carbonaceous; asci clavate, tapering to a long thread-like stalk, thin-walled, evanescent, 8-spored, aparaphysate; spores biseriate to crowded, hyaline, unicellular, inequilateral to allantoid.

This genus is closely related to *Nitschkia* Otth, differing from it in the possession of spiny perithecia.

KEY TO THE SPECIES OF ACANTHONITSCHKEA

A. Ascospores allantoid; perithecia 230–275 μ in diameter; spines 6–11 x 115–150 μ. 1. *A. argentinensis* (Figs. 11, 12).

B. Ascospores ellipsoid to subfusoid, inequilateral; perithecia 300–400 μ in diameter; spines 12–20 x 250–325 μ. 2. *A. macrobarbata* (Figs. 13, 14, 15, 29).

1. ACANTHONITSCHKEA ARGENTINENSIS Speg. Anal. Museo Nac. Buenos Aires III. **10**: 116. *1 fig.* 1908

ILLUSTRATION: Speg. Anal. Museo Nac. Buenos Aires III. **10**: *1 fig.* 1908.

TYPE: In Herb. Speg. La Plata, Argentine. The specimen was mailed to the writer by Professor Spegazzini, and was found to be in excellent condition. A slide showing the microscopic characters is deposited in the herbarium of the writer.

(Figures 11, 12)

Subiculum sparse to well developed, covering areas of indefinite extent on the surface of the bark, hardly 1 mm. in thickness, margin not sharply delimited, mycelial mat flat rather than pulvinate; hyphae 6–8 μ in diameter; spines 6–11 x 115–150 μ; perithecia scattered to densely gregarious, 230–275 μ in diameter, not buried in the subiculum, attached to it by basal hairs, not wooly, glabrous, black, shiny, minutely tuberculate, armed with spines identical with those on the mycelium, collapsing to deeply cupulate; the rim of the cup circular and thin; the ostiolum not evidently papillate either before or after the collapse, obscure; spines much less prominent than in the following species; asci 16–20 x 6–10 μ; ascospores allantoid, slightly to very markedly curved, ends obtuse, 6–8 x 2 μ.

On the bark of *Ilex paraguayensis* in Argentina and *Cajanus indicus* in Porto Rico.

MATERIAL EXAMINED

Argentina: Herb. Speg. (*type* collected near Cuias).

Porto Rico: Herb. Fitzpatrick *1890* (*ex Herb.* J. A. Stevenson *5065;* collected at Pueblo Viejo).

2. **Acanthonitschkea macrobarbata** sp. nov.

TYPE: In Herb. R. Thaxter at Harvard Univ. (a portion of the type collection deposited in Herb. Fitzpatrick as *1958*).

(Figures 13, 14, 15, 29)

Subiculum prominent, developed on the surface of the bark as a sharply delimited, pulvinate mat, approximately 1 cm. in diameter and 1–2 mm. in thickness; hyphae 8–12 μ in diameter; spines 250–325 x 12–20 μ; perithecia densely gregarious, 300–400 μ in diameter, not buried in the subiculum, heaped up on it, forming a convex colony containing several hundred individuals, not evidently tuberculate, slightly wooly, the rounded end provided with a papilliform ostiolum which later becomes umbilicate, finally collapsed to cupulate (the rim of the cup rather thick), often compressed to elliptic or somewhat angular, armed with about a dozen prominent spines identical with those on the mycelium, brownish-black, somewhat lighter-colored and less evidently iridescent than the hyphae and spines; asci 16–22 x 6–7 μ; ascospores ellipsoid to subfusoid, inequilateral, often flattened on one side, ends rounded, 5–8 x 2.5–3 μ, not curved.

On bark of unidentified tree in St. Ann's Valley, Port of Spain, Trinidad, British West Indies. Collector, Roland Thaxter.

Differing from the type species chiefly in its larger perithecia, larger spines, and in the shape of the spores.

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THE LICHENS OF THE ISLE OF PINES

LINCOLN W. RIDDLE*

The collection of lichens forming the basis of the present paper was made by Dr. and Mrs. N. L. Britton and Mr. Percy Wilson in February and March, 1916. A few specimens were collected by Dr. O. E. Jennings in 1910. The collection is of unusual interest on account of the large representation, 67 numbers in all, of rock-inhabiting lichens. Very little is known about the rock lichens of the West Indies. The only important collection of them, hitherto, was made by W. R. Elliott in the islands of Dominica and St. Vincent in 1891 and 1892; an account of Elliott's collections being given by Wainio in the London Journal of Botany for 1896. Charles Wright's rich collection of the lichens of Cuba included very few specimens on rocks. This probably accounts, in part at least, for the relatively large number of new species described in this paper.

The lichen flora of the Isle of Pines, so far as known at present, includes 49 genera with 127 species, of which 1 genus, 14 species, and 1 variety are new. Of the new species, 11 grow on rocks. Three of the new species are already known from other tropical localities, and until the rock lichens of Cuba are known it is obviously impossible to say how many species are endemic in the Isle of Pines. For the same reason, comparison of the lichen flora of the Isle of Pines with that of other islands in the West Indies would, at present, be valueless. It can be stated, however, that the number of distinctively tropical species is very large.

In the following list, localities outside of the Isle of Pines are cited only in cases where the distribution is restricted or little known.

1. **Thrombium echinulosporum** sp. nov.

Thallus epilithicus crustaceus uniformis effusus linea nigra limi-

* Deceased Jan 16, 1921. Published essentially without change from manuscript left by the author.

tatus, virescens vel viridi-glaucescens opacus, crassitudine mediocris aut tenuis, continuus laevigatus. Gonidia pleurococcoidea. Perithecia nigra integra subglobosa, ad 0.5 mm. lata, dispersa, primum semiimmersa dein emergentia et nuda basi thallino-tecta apice umbilicata demum elabentia foveolamque relinquentia. Gonidia hymenialia nulla. Paraphyses persistentes ramoso-connexae. Asci cylindrices 8-spori. Sporae in ascis uniseriales incolores ellipsoideae simplices olim biguttulatae membrana sat crassa et echinulata, 20–30 x 8–12 μ.

On limestone, Cerros de Vivijagua, collected by N. L. Britton, Elizabeth G. Britton, and Percy Wilson, Feb. 28–29, 1916, *15050* (type); on limestone, Sierra de las Casas, N. L. Britton and Percy Wilson, March 22, 1916, *15749, 15750*. *Thrombium echinulosporum* is apparently quite distinct from all other species of the genus.

2. **Microglaena Brittonii** sp. nov.

Thallus epilithicus crustaceus uniformis effusus haud limitatus, glaucus opacus, sat tenuis continuus laevigatus. Gonidia pleurococcoidea. Perithecia hemisphaerica, verrucas circ. 0.4 mm. latas dispersas aut partim approximatas convexas thallo obductas basi sensim in thallum abeuntes radiatim fissuratas ochroceulas formantia, ostiolo punctiforme fulvo, amphithecio superne fulvo inferne incolore, demum elabentia foveolamque relinquentia. Gonidia hymenialia nulla. Paraphyses persistentes simplices aut apicibus sparse ramosis. Asci clavati 8-spori. Sporae in ascis biseriales aut irregulares, incolores ellipsoideae aut oblongae muriformes 8-loculares loculis cubicis, 20–27 x 10–18 μ.

On limestone, Sierra de las Casas, collected by N. L. Britton and Percy Wilson, March 22, 1916, *15743* (type); also *15747, 15751;* Sierra de los Caballos, same collectors, March 2, 1916, *15152;* Vivijagua, same collectors, Feb. 20, 1916, *15048*.

This species is most closely related to **Microglaena scopularis** (Wainio) comb. nov. (*Thelenella* Wainio, Jour. Bot. **34**: 293. 1896), but differs in the thallus being continuous instead of broken into areoles and in the upper part of the amphithecium being fulvous instead of brownish-black. From both *M. brasiliensis* Muell. Arg. (Flora **71**: 547. 1888) and *M. saxicola* Muell. Arg. (Proc. Roy. Soc. Edinburgh **11**: 471. 1882) this new species differs in the color as well as the continuity of the thallus. I take pleasure in naming this in honor of Dr. N. L. Britton.

3. ARTHOPYRENIA CINCHONAE (Ach.) Muell. Arg. On *Savia sessiliflora*, Cerro San Juan del Mar, Colombia, *14674;* on *Savia*, Sierra de los Caballos, *15146;* on *Thrinax*, Vivijagua, *15083*.

4. ARTHOPYRENIA CONOIDEA (Fr.) Zahlbr. On limestone, Caleta Cocodrilos, *15290*.

5. ARTHOPYRENIA PLANORBIS (Ach.) Muell. Arg. On *Tabebuia*, Vivijagua, *15596*.

6. ARTHOPYRENIA TUMIDA Muell. Arg. in Revis. Lich. Eschweiler. Flora **67**: 669. 1884. On *Coccothrinax*, La Cañada, *14425, 14427*. Brazil.

There has been no material available for comparison, but the specimens agree well with Mueller-Argau's original description.

7. **Monoblastia** gen. nov.

Thallus crustaceus uniformis ecorticatus, gonidiis chroolepoideis. Perithecia solitaria nigra, ostiolo recto terminale. Paraphyses persistentes crassiusculae ramoso-connexae. Asci cylindrices. Sporae in ascis uniseriales, incolores sat magnae simplices, membrana crassiuscula laevigata.

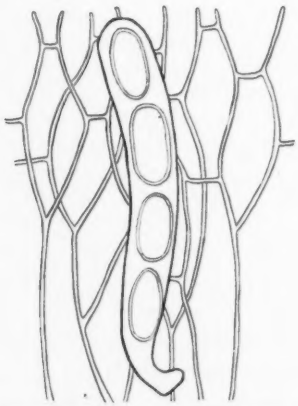


FIG. 1. *Monoblastia palmicola*. Ascus with spores and paraphyses.

This new genus belongs to the family Pyrenulaceae, as defined by Zahlbruckner in Engler and Prantl, Die Natürlichen Pflanzen-

familien I[1*]: 62. 1903. The only other genus of that family having simple spores is *Coccotrema* Muell. Arg. in Mission Scientifique au Cap Horn **5**: 171. 1889, which is described as having "paraphyses liberae tenues flaccidae," and Pertusaria-like verrucae often containing two or three perithecia. It is obvious that the characters of the plant from the Isle of Pines are generically distinct from those of *Coccotrema*. The genus is named *Monoblastia* in reference to the one-celled spores, a rare type in the Pyrenulaceae, and in analogy to *Polyblastia*, which has many-celled spores.

Monoblastia palmicola sp. nov.

Thallus epiphloeodes crustaceus uniformis effusus haud limitatus, albidus tenuis laevigatus continuus aut majore parte diffractus, KOH non reagens. Gonidia copiosa chroolepoidea. Perithecia circ. 0.5 mm. lata, dimidiata alte hemisphaerico-convexa basi innata cetero superficialia nuda nigra opaca, ostiolo minute umbilicato; amphithecio carbonaceo basi incompleto. Asci cylindrices 2–4-spori. Sporae ellipsoideae aut oblongae, 30–50 x 16–20 μ.

On *Thrinax*, Rocky Point, Ensenada de Siguanea, collected by N. L. Britton and Percy Wilson, March 13, 1916, *15423* (type).

8. PORINA FIRMULA Muell. Arg. On limestone, Cerro San Juan del Mar, Columbia, *14683;* on limestone, Cerros de Vivijagua, *15047*. Cuba.

9. **Porina** (Sect. Sagedia) **macrocarpa** sp. nov.

Thallus epilithicus crustaceus uniformis effusus linea nigra limitatus, glaucus virescens aut purpurascens opacus, crassitudine mediocris, aut tenuis, continuus laevigatus, olim spermagoniis nigropunctatus. Gondia chroolepoidea. Perithecia 1.0–1.5 mm. lata, solitaria aut confluentia dimidiata primum immersa leviter convexa dein emergentia elevata conico-hemisphaerica basi innata, nigra sat tenue thallino suffusa aut denudata, apice obtusa aut crasse papillata, demum elabentia foveolamque relinquentia, amphithecio carbonaceo basi deficienti. Paraphyses persistentes tenues simplices. Asci cylindrices 8-spori. Sporae in ascis uniseriales, incolores ellipsoideae, 4-loculares loculis subcylindricis angulis sat rotundatis, 13–16 x 5–7 μ. Spermagonia mediocria nigra apicibus emergentibus denudatis. Spermatia filiformia arcuata, 18–22 x 1 μ.

On limestone, Key View Hill, Vivijagua, collected by N. L. Britton, Elizabeth G. Britton, and Percy Wilson, Feb. 28–29,

1916, *15090* (type); Sierra de los Caballos, N. L. Britton and Percy Wilson, March 2, 1916, *15151;* Sierra de las Casas, same collectors, March 22, 1916, *15740.* Also on limestone, Cockburn Town, Watling's Island, Bahamas, N. L. Britton and C. F. Millspaugh, March 12–13, 1907, *6131;* and on limestone, Loiza, Porto Rico, N. L. Britton, B. H. Dutcher, and Stewardson Brown, March 23, 1915, *5745.*

The affinities of this species seem on the whole to be with the genus *Porina,* although it has peculiarities which make its systematic position somewhat uncertain. While the perithecia are for the most part solitary, they occur occasionally completely confluent except for the projecting papillate tips. The cells of the quadrilocular spores are somewhat more rounded than is typical for *Porina.* There is no other species with which this is liable to be confused.

10. PORINA MASTOIDEA (Ach.) Mass. On bark, San Juan, *15564.*

11. PORINA NUCULA Ach. On bark of *Oxandra,* Sierra de las Casas, *15758;* on rock (!), San Juan, *14998a.* I find no record of the occurrence of this species on rocks, but the specimen from San Juan offers no characters except the habitat to distinguish it from this species. But, as noted below, two normally bark-inhabiting species, *Lecidea pyrrhomelaena* and *Bombyliospora domingensis,* occur on rocks in the Isle of Pines, the identity of the bark-inhabiting and rock-inhabiting plants being beyond question in those two cases.

12. **Porina** (Sect. Segestria) **subfirmula** sp. nov.

Thallus epilithicus determinatus subfoliosus effiguratus irregularia rotundatus margine integro aut crenato haud lobato, planus arcte adnatus crassus (crassitudine 0.15–0.2 mm.), atro-olivaceus, continuus laevigatus vel sat inaequalis nitidulus; superne corticata cortice tenue (crassitudine 12–14 μ) pseudoparenchymatica, inferne ecorticata. Gonidia chroolepoidea. Perithecia subglobosa circ. 0.3 mm. lata, tota immersa aut apicibus leviter emergentibus et sat denudatis, amphithecio superne nigro inferne decolore. Paraphyses persistentes simplices. Asci 8-spori. Sporae incolores fusiformes, haud bene evolutae, 6–8-loculares, loculis cylindricis, circ. 25 x 4 μ.

On limestone, Sierra de las Casas, collected by N. L. Britton and Percy Wilson, March 22, 1916, *15741* (type).

This species is evidently related to, but quite distinct from, the remarkable *Porina firmula* Muell. Arg., in which the olivaceous, subfoliose thallus has convex lobes and is merely loosely adherent to the substratum. The present species is decidedly *Endocarpon*-like in habit.

13. PORINA TETRACERAE (Ach.) Muell. Arg. On rocks, Cerros de San Juan, *15504*. Another instance of an unusual habitat.

14. PORINA VARIEGATA Fée. On *Thrinax*, Rocky Point, Ensenada de Siguanea, *15417*.

15. **Porina** (Sect. Sagedia) **Wilsonii** sp. nov.

Thallus epilithicus crustaceus uniformis effusus haud limitatus, cretaceo-albus opacus tartareus, crassiusculus continuus laevigatus spermagoniis copiose nigropunctatus. Gonidia chroolepoidea. Perithecia globosa integra nigra 0.6–0.8 mm. lata, primum tota immersa maculis nigrescentibus indicata dein semiemergentia alte convexa strato tenue thallode fere ad instar pruinae velata demum apicibus denudatis, ostiolo minute umbonato, nunquam elabentia. Paraphyses persistentes tenues simplices. Asci cylindrices 8-spori. Sporae in ascis uniseriales, incolores fusiformes 4-loculares loculis cylindricis, 13–15 x 4–5 μ. Spermagonia minuta nigra apicibus emergentibus denudatis. Spermatia recta bacillaria, 3–5 x 1 μ.

On limestone, Caleta Cocodrilos, collected by N. L. Britton, Percy Wilson, and Brother Leon, March 8, 1916, *15288* (type).

This species, which I take pleasure in naming in honor of Mr. Percy Wilson, may be distinguished from other species of the section *Sagedia* by the chalky-white, tartareous thallus and the size of the perithecia, which are relatively large for the genus.

16. PYRENULA AURANTIACA Fée. On Plumèria, Vivijagua, *15085*.

17. PYRENULA COSTARICENSIS Muell. Arg. On *Calyptrogyne*, vicinity of Santa Barbara, *14767*. Costa Rica, Venezuela. There has been no material for comparison and the determination is not certain.

18. PYRENULA LEUCOPLACA (Wallr.) Koerb. On *Annona*, Vivijagua, *15599*.

19. ANTHRACOTHECIUM LIBRICOLUM (Fée) Muell. Arg. On *Lysiloma*, Vivijagua, *15041* in part; on *Lonchocarpus*, same locality, *15038* (old).

20. ANTHRACOTHECIUM OCHRACEOFLAVUM (Nyl.) Muell. Arg. Vivijagua, on *Thrinax*, *15081*, on *Lysiloma*, *15042*, *15600*; on *Thrinax*, Rocky Point, Ensenada de Siguanea, *15421*; on *Omphalea*, Punta Columba, *15645a*, *15648*. This is a variable species, the thallus varying in color from vitelline-yellow to rusty-orange, and the spores varying considerably in size and in number of cells.

21. ANTHRACOTHECIUM PALMARUM (Krempelh.) Muell. Arg. On *Thrinax*, Vivijagua, *15083* in part. Venezuela, Samoa. This is a little know but easily recognizable species, distinguished from the preceding species by the brick-red tint of the thallus and by the shorter spores with irregularly placed cells.

22. ANTHRACOTHECIUM PYRENULOIDES (Mont.) Muell. Arg. On *Annona*, vicinity of Siguanea, *14389*.

23. MELANOTHECA ACHARIANA Fée. On *Savia sessiliflora*, Cerro San Juan del Mar, Columbia, *14672*. Cuba, Virgin Islands, Guiana, Venezuela.

24. MELANOTHECA CRUENTA (Mont.) Muell. Arg. On bark, San Juan, *15563*.

25. TRYPETHELIUM AENEUM (Eschw.) Zahlbr. On *Byrsonima*, Sierra de la Cañada, *14428*. Florida, Bahamas, Cuba, Costa Rica, Brazil.

26. TRYPETHELIUM CATERVARIUM (Fée) Tuck. On *Annona*, vicinity of Siguanea, *14384*. Alabama, Bahamas, Cuba, Porto Rico, Costa Rica.

27. TRYPETHELIUM ELUTERIAE Spreng. On *Peltophorum*, vicinity of Siguanea, *14383*; on *Lysiloma bahamensis*, Boqueron, Ensenada de Siguanea, *14538*.

TRYPETHELIUM ELUTERIAE NIGRICANS (Fée) Muell. Arg. On *Hippomane*, Rocky Point, Ensenada de Siguanea, *15410*.

28. TRYPETHELIUM INFUSCATULUM Muell. Arg. On *Anacardium*, vicinity of San Pedro, *14340*. Cuba.

29. TRYPETHELIUM MASTOIDEUM Ach. On *Exostema*, Caleta Cocodrilos, *15327*.

30. TRYPETHELIUM OCHROLEUCUM PALLESCENS (Fée) Muell. Arg. On *Hippomane*, Rocky Point, Ensenada de Siguanea, *15408*.

31. TRYPETHELIUM OCHROTHELIUM Nyl. On *Peltophorum*, vicinity of Siguanea, *14383a;* on *Tabebuia*, Loma la Daguilla, *15183;* on *Curatella*, Cerro de la Jia, *15210*. Bahamas, Colombia.

32. TRYPETHELIUM PAPILLOSUM Ach. On *Xylopia grandiflora*, La Cunagua, *14576*. Cuba, Guiana, Guinea, tropical Africa.

33. TRYPETHELIUM TROPICUM (Ach.) Muell. Arg. On orange, La Cunagua, *14588a;* on *Hippomane*, Rocky Point, Ensenada de Siguanea, *15409*.

34. PARATHELIUM INDUTUM Nyl. On *Omphalea*, Punta Columba, Vivijagua, *15646*. Porto Rico, St. Thomas, Colombia.

35. PLEUROTHELIUM INCLINATUM Muell. Arg. On *Celtis*, Vivijagua, *15077*. Cuba.

36. HEUFLERIA SEPULTA (Mont.) Trev. On *Genipa*, San Juan, *15565*. Cuba, Jamaica, Guiana, Brazil, Peru.

37. **Phylloporina dilatata** (Wainio) comb. nov.
Porina dilatata Wainio Lich. Brés. **2**: *227*. 1890.
On leaves of *Jambos*, Sierra de las Casas, *15768*. Brazil.

38. PHYLLOPORINA PHYLLOGENA Muell. Arg. On leaves of *Rheedia*, San Juan, *15487;* on leaves of *Jambos*, La Cunagua, *14595*.

39. STRIGULA ANTILLARUM (Fée) Muell. Arg. On leaves of *Jambos*, Sierra de las Casas, *15768a*.

40. STRIGULA ELEGANS (Fée) Muell. Arg. On leaves of *Gymnanthes*, Cerros de Vivijagua, *15022;* same habitat, Sierra

de las Casas, *15764;* on leaves of *Pseudolmedia spuria,* San Juan, *15559.*

STRIGULA ELEGANS INTERMEDIA Muell. Arg. On leaves of *Hirtella,* La Cunagua, *14593b.*

41. STRIGULA PLANA Muell. Arg. On leaves, San Juan, *15558.* Cuba, Costa Rica, Venezuela. Wainio (Lich, Brés. **2**: 229. 1890) considers this synonymous with the preceding species.

42. MYCOPORELLUM ESCHWEILERI Muell. Arg. Revis. Lich. Eschweiler. in Flora **71**: 526. 1888. On *Pachyanthus,* vicinity of Los Indios, *14183.* Brazil. There has been no material available for comparison, but the specimen agrees well with Mueller-Argau's original description.

43. ARTHONIA COMPLANATA Fée. On *Calyptrogyne,* vicinity of San Pedro, *14486.*

44. ARTHONIA MICROSPERMA Nyl. On *Bumelia,* Rocky Point, Ensenada de Siguanea, *15412.* Cuba.

45. ARTHONIA POLYMORPHA Ach. Vivijagua, on *Lonchocarpus, 15037, 15038a, 15039;* on *Ichthyomethia, 15084;* on *Omphalea, 15647.*

46. ARTHOTHELIUM CHLOROLEUCUM Muell. Arg. On *Thrinax,* Rocky Point, Ensenada de Siguanea, *15420.* A striking and beautiful species, known previously from the original collection only, made by Charles Wright in Cuba.

47. ARTHOTHELIUM SPECTABILE (Flot.) Mass. On *Mangifera,* San Pedro, *14823;* on limestone, Sierra de las Casas, *15738.*

48. OPEGRAPHA ACICULARIS Riddle Mem. Brooklyn Bot. Gard. **1**: 110. 1918. On *Thrinax,* Vivijagua, *15082;* on *Omphalea,* Punta Columba, Vivijagua, *15644.* Bahamas, Porto Rico, St. Thomas.

49. OPEGRAPHA BONPLANDI Fée. On *Oxandra,* Cerros de San Juan, *14994;* on *Thrinax,* Rocky Point, Ensenada de Siguanea, *15419;* on bark, Vivijagua, O. E. Jennings, *123a.*

50. OPEGRAPHA CALCAREA Turn. On limestone, Caleta Cocodrilos, *15289.*

51. OPEGRAPHA LITHYRGA Ach. On limestone, Rocky Point, Ensenada de Siguanea, *15427*.

Opegrapha lithyrga notha var. nov.

Thallus ut in forma typica. Apothecia 0.5–1.5 mm. longa, aggregata, mox disco aperto plano, demum lirellis confluentibus subdifformibus. Sporae ut in forma typica.

On limestone, Sierra de las Casas, N. L. Britton and Percy Wilson, March 22, 1916, *15745* (type). Apart from the apothecia, this material offers no characters to distinguish it from *Opegrapha lithyrga* Ach. The proposed variety bears the same relation to the species as the var. *notha* (Ach.) Fr. to *O. varia* Pers. and the var. *arthonoidea* Leight. to *O. atra* Pers. It is probable that *Opegrapha lithyrgiza* Wainio Lich. Brés. 2: 132. 1890, is a synonym. But the plant is certainly not of valid specific rank.

52. **Opegrapha oleaginea** sp. nov.

Thallus epilithicus crustaceus uniformis subdeterminatus, fuligineus aut partim nigro-brunneus partim umbrinus linea obscuriore limitatus, crassitudine tenuis aut mediocris, continuus laevigatus quasi oleagineus. Apothecia lirelliformia pro maxima parte 0.5–1.0 mm., rarius ad 3 mm., longa, gracilis circ. 0.2 mm. lata, sessilia vel sat elevata, recta aut rarius sat flexuosae, nigra, disco rimaeformi labiis integris laevigatis conniventibus; amphithecio nigro basi integri; epithecio fusco, hymenio et hypothecio fusco tincto. Asci clavati 8-spori. Sporae in ascis biseriales aut irregulares, incolores fusiformes 4-loculares loculis cylindricis, 15–18 x 4–5 μ.

On limestone, Sierra de las Casas, N. L. Britton and Percy Wilson, March 22, 1916, *15739* (type).

The dark color and oily appearance of the thallus will serve to distinguish this species from others of the genus having four-celled spores.

53. OPEGRAPHA PROSODEA Ach. On *Oxandra*, Cerros de San Juan, *14995*, *14996*.

54. OPEGRAPHA SAXICOLA Ach. On limestone, Cerros de Vivijagua, *15049*, *15052*, *15054*.

55. OPEGRAPHA VIRIDIS Pers. On *Thrinax*, Vivijagua, *15083a*. Not quite typical, as the thallus is almost white.

56. GRAPHIS AFZELII Ach. On *Annona palustris,* Siguanea, *14388;* San Pedro, on *Anacardium, 14484;* on *Calophyllum, 14485;* on orange, La Cunagua, *14588;* on *Swietinia,* Caleta Cocodrilos, *15325.*

57. GRAPHIS ELEGANS (Borrer) Ach. On *Purdiaea,* vicinity of Los Indios, *14229;* on *Icica,* San Pedro, *14826;* on *Annona,* vicinity of Siguanea, *14385;* on orange, La Cunagua, *14575, 14589;* on *Tabebuia,* San Francisco Heights, *15119;* on *Eugenia,* Sierra de los Caballos, *15141.*

58. GRAPHIS GLAUCESCENS Fée. On *Guazuma,* Cerro San Juan del Mar, Columbia, *14671.* Guadeloupe, Colombia, Brazil.

59. GRAPHIS NITIDA (Eschw.) Nyl. On *Oxandra,* Caleta Cocodrilos, *15279.* South Carolina, Alabama, Cuba, Guiana.

60. GRAPHIS PAVONIANA Fée. On *Coccolobis,* Vivijagua, *15643.*

61. GRAPHIS SCRIPTA (L.) Ach. On *Savia sessiliflora,* Cerro San Juan del Mar, Columbia, *14673;* on *Tabebuia,* Vivijagua, *15597.*

62. GRAPHIS TENELLA Ach. On *Lysiloma,* Vivijagua, *15041;* Sierra de los Caballos, *15148.*

63. GRAPHIS VESTITA Fr. On *Theaceae,* vicinity of Santa Barbara, *14778.* The original material of this species came from tropical America, but its exact distribution is uncertain.

64. GRAPHINA POITAEI (Fée) Muell. Arg. On bark, Cerro de la Jia, *15215.* St. Domingo, Costa Rica, Colombia.

65. GRAPHINA SOPHISTICA (Nyl.) Muell. Arg. On *Annona bullata,* Cerro de la Jia, *15212.*

66. GRAPHINA VIRGINEA (Eschw.) Muell. Arg. On *Exostema,* Caleta Cocodrilos, *15326.*

67. PHAEOGRAPHINA CINEREOPRUINOSA (Fée) Muell. Arg. On bark, Loma La Daguilla, *15167;* on *Hippomane,* Rocky Point, Ensenada de Siguanea, *15411.*

68. GLYPHIS CICATRICOSA Ach. On *Annona palustris,* Siguanea, *14386;* on *Lysiloma,* Boqueron, Ensenada de Siguanea, *14537;* on *Eugenia,* Sierra de los Caballos, *15142;* on *Exostema,* Caleta Cocodrilos, *15328.*

69. SARCOGRAPHA LABYRINTHICA (Ach.) Muell. Arg. On *Matayba,* vicinity of San Pedro, *14483.*

70. LECANACTIS AMERICANA Wainio. On *Gymnanthes,* Cerro San Juan del Mar, Columbia, *14675.* Brazil.

71. OCELLULARIA ACTINOTA (Tuck.) Muell. Arg. On *Lysiloma,* Sierra de las Casas, *15760.* Cuba, Jamaica.

72. OCELLULARIA GRANULOSA (Tuck.) Muell. Arg. On *Calyptrogyne,* vicinity of Santa Barbara, *14766.* Louisiana, Florida.

73. **Ocellularia subtilis** (Tuck.) comb. nov.
Thelotrema subtile Tuck. Am. Journ. Sci. **25**: 426. 1858.

On bark, Caleta Cocodrilos, *15280.* Eastern United States from New England to Texas. Also Ireland, Japan, Australasia.

74. **Leptotrema polyporum** sp. nov.

Thallus crustaceus uniformis indeterminatus crassus (crassitudine ad 0.5 mm.) undulatus desquamescens, superne continuus rugulosus olivaceus aut glauco-olivaceus opacus. Apothecia numerosissima thallo omnino immersa aut rarius verruculas minutas leviter convexas formantia, ostiolo minutissime (0.07–0.12 mm. late) punctiforme rotundato, margine ostiolare integro, thallo concolore aut paullo pallidiore, de supra disco non perspicuo. Intra omnino decolorata. Columella nulla. Asci 8-spori. Sporae fuscae ellipsoideae murali-divisae 4- (rarius 6-) loculares loculis mediis divisis, 14–16 x 6–8 μ.

On bark, Sierra de los Caballos, near Nueva Gerona, collected by O. E. Jennings, May 12, 1910, *229a* (type). Also Florida, without exact locality, collected by Miss Wilson, in Herb. Tuckerman, under the manuscript name *Thelotrema polyporum.*

This species is evidently related to *Leptotrema Wightii* (Taylor) Muell. Arg., but differs in having the ostioles less than half as large, but much more numerous and crowded; the spores are distinctly narrower than in *L. Wightii.*

75. **Leptotrema simplex** (Tuck.) comb. nov.
Thelotrema simplex Tuck. Proc. Am. Acad. Arts and Sci. **6**: 271. 1864.

On bark, Rocky Point, Ensenada de Siguanea, *15414*. Cuba.

76. LEPTOTREMA WIGHTII (Taylor) Muell. Arg. On rocks, Cerros de San Juan, *15500*.

77. GYROSTOMUM SCYPHULIFERUM (Ach.) Fr. On *Eugenia*, Sierra de los Caballos, *15140*.

78. LECIDEA BRUJERIANA (Schaer.) Nyl. On rock, San Juan, *15506*.

79. LECIDEA PIPERIS (Spreng.) Nyl. On *Oxandra*, Sierra de las Casas, *15759*.

80. LECIDEA PYRRHOMELAENA Tuck. On sandstone, Sierras de las Tunas, *15520*. This material has been compared with the type specimen which grew on bark in Cuba, where it was collected by Charles Wright. It is a very well-marked species.

81. **Bacidia microphyllina** (Tuck.) comb. nov.
Lecidea microphyllina Tuck. Proc. Am. Acad. Arts and Sci. **6**: 278. 1864.

On bark, Sierras de las Tunas, *15512;* on *Amyris elemifer*, Sierra de las Casas, *15765*. Cuba.

82. **Bilimbia Sprucei** (Muell. Arg.) comb. nov.
Patellaria Sprucei Muell. Arg. Flora 64: 228. 1881.

On leaves of *Jambos*, Sierra de las Casas, *15768a;* on leaves of *Hirtella*, La Cunagua, *14593*. Brazil.

83. BOMBYLIOSPORA DOMINGENSIS (Pers.) Zahlbr. On royal palm, Cerro de la Jia, *15213;* San Juan, *15586a;* on rocks (!), Cerros de San Juan, *15499;* on *Amyris elemifera*, Sierra de las Casas, *15762*.

84. **Phyllopsora cryptocarpa** sp. nov.

Thallus granulosus, e granulis minutissimis isidioideo-confluentibus concatenatisve constants, haud squamulosus, crassus (crassitu-

dine ad 0.5 mm.) arcte adnatus areolato-rimosus vel diffractus, umbrinus. Apothecia minuta, 0.2–0.4 mm. lata, numerosa dispersa aut approximata sessilia vel adpressa rotundata regularia, disco plano rufo-badio aut atro-castaneo, margine proprio concolore aut paullo pallidiore integro primum crassiusculo dein tenuiore autem persistente, margine thallino nullo; epithecio et hypothecio badio, hymenio fulvo. Asci 8-spori. Sporae incolores ellipsoideae simplices, 10–12 x 4 μ.

On rotten wood, San Juan, collected by N. L. Britton, Elizabeth G. Britton, and Percy Wilson, March 15, 17, 1916, *15588* (type).

This species is related to *Phyllopsora furfuracea* (Pers.) Zahlbr. and still more closely to **Phyllopsora isidiotyla** (Wainio) comb. nov. (*Lecidea isidiotyla* Wainio Lich. Brés. **2**: 49. 1890), but differs from all other species of the genus in the minute, inconspicuous apothecia.

85. PHYLLOPSORA FURFURACEA (Pers.) Zahlbr. On *Calyptrogyne*, La Cunagua, *14596*.

86. PHYLLOPSORA PARVIFOLIA (Pers.) Muell. Arg. On royal palm, San Juan, *15586*.

87. CLADONIA BEAUMONTII (Tuck.) Wainio. On white sand, vicinity of Los Indios, *14196*. North Carolina, Alabama.

88. CLADONIA DIVARICATA Nyl. On white sand, vicinity of Los Indios, *14254*. Brazil.

89. CLADONIA MEDUSINA (Bory.) Nyl. On white sand, vicinity of Los Indios, *14195*. Brazil, tropical Africa.

90. CLADONIA UNCIALIS (L.) Web. On white sand, vicinity of Los Indios, *14255*. This is a peculiar habitat form, with inflated, subsimple podetia, 40–70 mm. high and 5–10 mm. thick.

91. PYRENOPSIS PHAEOCOCCA Tuck. On granitic rock, vicinity of Siguanea, *14392*. New England, North Carolina.

92. **Anema bullata** sp. nov.

Thallus squamaeformis, e squamis bullatis subglobosis aut rarius irregularibus haud lobatis 1–2 mm. latis, ad 1 mm. altit., umbilicato-adfixis contiguis aut partim dispersis, umbrino-olivaceus nitidulus,

sicco cartilagineo madefacto subgelatinoso; intra omnino pseudoparenchymaticus, strato exteriore crebre contexto cellulis 4–6 μ latis, parte interiore paullo laxiore. Gonidia gloeocapsoidea cellulis 6–11 μ diam. in glomerulosas circa 14–20 μ diam. consociatis, tegumento gelatinoso fuscoluteo. Apothecia minuta omnino immersa primum endocarpea margine connivente ostiolo punctiforme, indicata, demum paullo aperta disco badio. Asci 8-spori. Sporae incolores oblongo-ellipsoideae simplices, 10–12 x 6–7 μ. Spermagonia pyriformia thallo immerso, ostiolo haud perspicuo. Spermatia ovoidea minutissima.

On limestone, Key View Hill, Vivijagua, collected by N. L. Britton, Elizabeth G. Britton, and Percy Wilson, Feb. 28–29, 1916, *15089* (type).

This species has an external resemblance to *Omphalaria pyrenoides* Nyl., but differs in the color and in the internal structure of the thallus.

93. **Thyrea cubana** (Tuck.) comb. nov.

Omphalaria cubana Tuck. Genera Lichenum 83. 1872.

On limestone, Rocky Point, Ensenada de Siguanea, *15425*. Cuba.

94. THYREA GIRARDI (Dur. & Mont.) Bagl. & Car. On limestone, Rocky Point, Ensenada de Siguanea, *15424*. Alabama; also Europe.

The specimens are sterile and the determination is not certain, but they agree with material in the Tuckerman Herbarium labelled "probably young *Omphalaria Girardi*."

95. DICHODIUM BYRSINUM (Ach.) Nyl. On royal palm, La Cunagua, *14603*.

96. LEPTOGIUM CHLOROMELUM (Sw.) Nyl. On *Annona palustris*, vicinity of Jucaro, *14644*.

LEPTOGIUM CHLOROMELUM STELLANS Tuck. On *Bucida spinosa*, vicinity of Siguanea, *15391;* on *Conocarpus*, Rocky Point, Ensenada de Siguanea, *15416;* on bark, vicinity of Columbia, *15711*.

97. LEPTOGIUM TREMELLOIDES CAESIUM (Ach.) Hue. On *Thrinax*, Rocky Point, Ensenada de Siguanea, *15418;* on royal palm, San Juan, *15484, 15485*.

98. COCCOCARPIA PELLITA GENUINA Muell. Arg. On *Peltophorum*, vicinity of Siguanea, *14382*.

COCCOCARPIA PELLITA PARMELIOIDES (Hook.) Muell. Arg. On orange, La Cunagua, *14587;* on royal palm, San Juan, *15585*.

COCCOCARPIA PELLITA SMARAGDINA (Pers.) Muell. Arg. On royal palm, San Juan, *15589*.

COCCOCARPIA PELLITA TENUIOR (Nyl.) Muell. Arg. On royal palm, San Juan, *15486*.

99. PERTUSARIA VELATA (Turn.) Nyl. On *Curatella*, Cerro de la Jia, *15209*.

100. LECANORA CALCAREA CONTORTA Fr. On sandstone, La Cunagua, *14580;* on rock, vicinity of Siguanea, *15238*.

101. LECANORA CINEREA (L.) Sommerf. On schist, Sierra de la Cañada, *14438*.

Spores smaller than in northern material, but the same thing is true of tropical specimens of *Buellia parasema*.

102. LECANORA CINEREOCARNEA (Eschw.) Wainio. On *Coccothrinax*, La Cañada, *14424* in part; on *Lysiloma*, Vivijagua, *15040;* on *Coccolobis*, Vivijagua, *15643a;* on bark, Rocky Point, Ensenada de Siguanea, *15407*.

103. LECANORA PROSECHA Ach. On limonite conglomerate, Rio de las Casas, *15660, 15661*. Distribution uncertain, but definitely recorded from the islands of Dominica and St. Vincent, in the West Indies, and from Colombia, South America. The specimens agree well with the detailed description given by Wainio in the Jour. Bot. **34**: 35. 1896.

104. LECANORA VARIA (Ehrh.) Nyl. On *Coccothrinax*, La Cañada, *14424* in part.

105. HAEMATOMMA PUNICEUM LEPRARIOIDES Wainio. On *Purdiaea*, vicinity of Los Indos, *14230*.

106. PARMELIA ABSTRUSA Wainio. On quartz rocks, La Cañada, *14435;* Las Tunas, *15519;* vicinity of Siguanea, *15239*. Brazil.

107. PARMELIA LATISSIMA CRISTIFERA (Taylor) Hue. On orange, La Cunagua, *14586;* on *Conocarpus,* Rocky Point, Ensenada de Siguanea, *15415.*

108. PARMELIA PLURIFORMIS Nyl. On schist, Sierra de la Cañada, *14436;* vicinity of Siguanea, *15237.* Brazil.

109. PARMELIA STENOPHYLLOIDES (Muell. Arg.) Wainio. On rocks, vicinity of Siguanea, *14391, 14393.* Brazil, Paraguay.

110. RAMALINA MONTAGNEI DeNot. On *Pseudocarpidium,* Vivijagua, *15075.*

111. RAMALINA USNEOIDES (Ach.) Fr. On *Bucida,* Coe's Camp, Ensenada de Siguanea, *14835;* vicinity of Columbia, *15717.*

112. USNEA FLORIDA STRIGOSA Ach. On branches, Siguanea, *14950.*

113. USNEA IMPLICITA (Stirton) R. H. Howe Mycologia **6**: 262. 1914.
Eumitria implicita Stirton Scot. Nat. **6**: 100. 1881.

On *Bucida spinosa,* vicinity of Columbia, *15716.* Jamaica, Porto Rico.

The material is softer and more pendulous than usual.

114. **Blastenia Brittonii** Zahlbr. ms. in Herb. New York Bot. Gard.

Thallus epilithicus crustaceus uniformis aut ambitu subradiato-lobulatus effiguratusque, centro rimoso-areolatus areolis leviter convexis contiguis aut dispersis hypothallo nigro, crassiusculus, albidus vel albido-cinerascens. Apothecia ad 0–6 mm. lata regularia sessilia superficialia dispersa, primum fusca dein omnino nigra opaca, disco plano, margine proprio crassiusculo et prominente aut tenuiore persistente integro aut crenulato, margine thallino nullo; excipulo nigro, epithecio badio, hymenio et hypothecio incolore. Asci 8-spori. Sporae incolores ellipsoideae polari-biloculares membrana inaequaliter incrassato loculis poro confluentibus, 12–14 x 6–7 μ.

On rock, Culebra Island near Porto Rico, collected by N. L. Britton and W. M. Wheeler, March 3–12, 1906, *260* (type). On

sandstone, Loma La Daguilla, Isle of Pines, *15179;* Cerro de la Jia, *15232;* on rocks, Cerros de San Juan, *15502;* on limestone, Cerros de Guanabana, *15640.*

The thalline characters are similar to those of *Blastenia phaea* (Tuck.) Muell. Arg. and of *Blastenia nigrocincta* Riddle. But the blackening apothecia with margin and disk concolorous are distinctive.

115. BLASTENIA FORSTROEMIANA (Fr.) Muell. Arg. On limestone, Cerro San Juan del Mar, Columbia, *14681;* Cerros de Vivijagua, *15056, 15057.* The type locality for this species is the "West Indies," but without the definite locality being specified.

116. BLASTENIA NIGROCINCTA Riddle Mem. Brooklyn Bot. Gard. 1: 113. 1918. On limestone, Key View Hill, Vivijagua, *15088.* Porto Rico, Virgin Islands. Also on bark (!), Palm Barren, City of Santa Clara, Cuba, N. L. Britton, Elizabeth G. Britton, and Percy Wilson, March 29–31, 1910, *6209.*

117. BLASTENIA PHAEA (Tuck.) Muell. Arg. On rocks, Cerros de San Juan, *14997, 14999, 15503, 15505;* on limestone, Cerro San Juan del Mar, Columbia, *14682;* on limestone, Vivijagua, *15051, 15087;* on sandstone, Loma La Daguilla, *15178, 15180.* Cuba.

The original material of this species was somewhat scanty, and the description given by Tuckerman is brief, so that it seems worth while to give an amplified description on the basis of the full material from the Isle of Pines, especially as the species appears to be a variable one.

Thallus crustose, indeterminate, effuse, the margin not at all effigurate, of medium thickness, whitish or glaucous, or occasionally smoky, continuous and irregularly rimulose, or more often definitely rimose-areolate, the areoles flat, undulate, or convex, usually contiguous, sometimes scattered, on a black hypothallus which may be well developed or evanescent. Apothecia 0.4–0.6 mm. in diameter, when young with fulvous or badious disk and a pale, thick, entrie or flexuous margin, later the persistent margin becoming concolorous with the disk, and both darken to a deep

brown, but never to black. Epithecium fulvous to badious, lamina otherwise colorless. Spores colorless, oblong-ellipsoid, polar-bilocular, the cells rarely connected with a tube, very uniform in size, about 10 x 5 μ.

118. **Buellia Brittoniae** sp. nov.

Thallus epilithicus crustaceus arcte adnatus determinatus effiguratus, ambitu pulchre radiato-laciniatus isabellinus nitidulus, laciniis 0.2–0.4 mm. latis contiguis sublinearibus aut partim cuneatis leviter convexis, centro rimoso-areolatus vel diffractus fuligineus, areolis convexis contiguis, sat tenuis crassitudine vix 0.2 mm., intus albissimus; KOH non reagens. Hypothallus nigricans evanescens. Apothecia 0.3–0.5 mm. lata, sessilia aut adpressa haud immersa, dispersa aut paullo approximata rotundata regularia omnino fusconigra aut nigra opaca, disco scabroso primum planiusculo margine tenuissimo dein mox convexo emarginato; epithecio crasso nigro, hypothecio fusco. Asci 8-spori. Sporae fuscae oblongo-ellipsoideae biloculares haud placodiomorphae membrana aequaliter tenue, 11–14 x 4–5 μ.

On sandstone, La Cañada, collected by N. L. Britton, Elizabeth G. Britton, and Percy Wilson, Feb. 16, 1916, *14579* (type). Also on quartz, Las Tunas, *15518*.

This is a well-marked and very distinct species, and can not be readily confused with any other. Its thalline characters are suggestive of those of *Rinodina thysanota* Tuck., but the apothecia and spores are entirely typical of the genus *Buellia*. I take pleasure in naming this—one of the finest of the new species from the Isle of Pines—in honor of Mrs. Elizabeth G. Britton.

119. **Buellia flavogranulosa** sp. nov.

Thallus epilithicus crustaceus effusus indeterminatus flavus, granularis, granulis minutis, 0.1–0.3 mm. latis, rotundatis aut paullo lobatis subsquamuliformibus late dispersis; KOH non reagens. Hypothallus nullus. Apothecia 0.5–0.7 mm. lata dispersa sessilia aut sat elevata rotundata regularia, disco primum plano demum leviter convexo, nigro nudo nitidulo, margine proprio nigro tenue persistente integro, margine thallino nullo; epithecio et hypothecio nigricante, hymenio decolore. Asci 8-spori. Sporae fuscae ellipsoideae biloculares placodiomorphae loculis poro haud confluentibus, 16–18 x 8 μ.

On sandstone, La Cunagua, collected by N. L. Britton, Elizabeth G. Britton, and Percy Wilson, Feb. 19, 1916, *14578* (type).

This species differs from *Buellia prospersa* (Nyl.) Riddle, which has spores of the same type, in having the thallus in the form of scattered granules of an intense-yellow color. From other rock-inhabiting species of *Buellia* with yellow thallus, this differs in the polar-bilocular spores.

120. BUELLIA PARASEMA (Ach.) Th. Fr. On *Conocarpus*, Siguanea, *14940*.

121. BUELLIA SANGUINARIELLA (Nyl.) Wainio. On *Colpothrinax*, San Pedro, *14827*. Bahamas, Cuba, Colombia.

122. BUELLIA SUBDISCIFORMIS (Leight.) Wainio. On *Cocothrinax*, La Cañada, *14423a*, *14426*; on *Colpothrinax*, San Pedro, *14549*, *14550*; on *Lysiloma*, Vivijagua, *15034*; on *Oxandra*, Sierra de los Caballos, *15145*.

123. **Buellia subdispersula** sp. nov.

Thallus epilithicus crustaceus effusus indeterminatus, cinereus aut cinereo-stramineus, areolatus areolis minutis ad 0.5 mm. latis contiguis aut dispersis pulvinatis rugulosis vel irregularibus partim squamuliformibus; KOH haud reagens. Hypothallus albidus evanescens. Apothecia 0.3–0.5 mm. lata, dispersa aut approximata, sessilia rarius paullo immersa, rotundata regularia, disco nigra scabro opaco, primum plano margine proprio tenue nigro, dein convexo emarginato; epithecio et hypothecio fusco-nigricante. Asci 8-spori. Sporae fuscae ellipsoideae aut oblongae, biloculares placodiomorphae, membrana inaequaliter incrassato luminibus depresso-cordatis approximatis, 14–20 x 7–9 μ.

On sandstone, La Cunagua, collected by N. L. Britton, Elizabeth G. Britton, and Percy Wilson, Feb. 19, 1916, *14577* (type).

In the thalline characters this is related to *Buellia dispersula* Muell. Arg., but it differs in the convex, emarginate apothecia, and in having spores of the type found in the section Mischoblastia of the genus Rinodina.

124. PYXINE COCOES (Sw.) Nyl. On *Pseudocarpidium*, Vivijagua, *15080*.

125. PHYSCIA CRISPA (Pers.) Nyl. On *Sideroxylon*, Sierra de los Caballos, *15144*; on *Thrinax*, Rocky Point, Ensenada de Siguanea, *15422*.

126. PHYSCIA INTEGRATA Nyl. On *Tabebuia,* Vivijagua, *15598;* on bark, Mt. Diablo above Vivijagua, *124a.*

PHYSCIA INTEGRATA SOREDIOSA Wainio. On *Curatella,* Cerro de la Jia, *15208.*

127. PHYSCIA PICTA (Sw.) Nyl. On *Cordia collococca,* Cerro San Juan del Mar, Columbia, *14670.*

ANTHRACNOSE OF THE BOSTON FERN[1]

JAMES A. FARIS

(WITH PLATES 8 AND 9)

The Boston fern (*Nephrolepis exaltata* (L.) Schott.) is a house plant very widely grown for ornamental purposes, and because of its merited popularity as an indoor plant its culture constitutes one of the valuable branches of the florist trade. The unusual freedom from disease of these ferns under indoor conditions contributes largely, no doubt, to their wide cultivation.

In the extensive fern collection of Dr. R. C. Benedict at the Brooklyn Botanic Garden, where he is experimenting upon the origin of new varieties of *Nephrolepis* (**2**, **3**), some plants have become attacked by an anthracnose disease. This condition was first noticed by Dr. Benedict in 1919 and seemed to be confined to certain sporeling strains then under observation. Although serious injury was confined to a few individuals, these infected plants continued to have diseased fronds season after season. A planting of sporelings set out for bed-culture in the fall of 1921 were so seriously diseased that they made little growth, each new leaf being killed at its growing tip soon after it began to unroll. Such plants showed a mass of dead and withered stumps of fronds with here and there a straggling leaf which had escaped death, but always showing the anthracnose lesions.

SYMPTOMS OF THE DISEASE

The disease first appears upon the growing tips of the fronds and upon other succulent leaf-tissue which has not become hardened. The lower parts of the fronds sometimes show typical anthracnose lesions; but the writer's observations have been that the infection in these cases has always taken place before the tissue has become hardened and woody.

The first appearance of the disease is indicated by a slight browning of the infected tissue. This becomes apparent in inoculations

[1] Brooklyn Botanic Garden Contributions No. 29.

from pure cultures about forty-eight hours after spraying the inoculum upon uninjured, vigorously growing fronds. The brown spotting involves only a few of the epidermal cells at first, but rapidly spreads longitudinally and around the midrib and petiole of the frond, finally involving the young pinnae. Attacked tissues shrink rapidly, presenting an appearance such as is shown in figure 1 at the end of the fifth day after inoculation.

When the plant is kept under humid conditions, small white patches begin to appear over the surface of the brownish lesions within a few days, but these white masses of conidia do not become apparent except under conditions of high humidity. Seldom does the canker appear over the entire frond, but two or three separate lesions on the same frond are not uncommon. The infection of the older fronds is limited to the young parenchymatous tissues near the apex of the leaves. A considerable area of the leaf may become infected in this way, as is shown in figure 2, which is a photograph of four older leaves inoculated with pure cultures of the organism at varying distances behind the unrolling tip. The inoculation was made at one inch behind the tip in *A*, two inches behind in *B*, three inches behind in *C*, and four inches behind in *D*. Inoculations farther back upon the maturer leaves gave no infection.

In exceptional cases, where the lower part is attacked, the unrolling tip may continue growth for a time. It is short-lived, however, and eventually withers, shrivels, turns brown and finally almost black. Attacks on older tissues by the fungus may result in a limited canker being produced. As a whole, susceptible ferns present a blighted, sickly appearance with their numerous dead fronds far outnumbering the isolated, partially diseased ones which have been able to develop a few pinnae.

THE CAUSAL ORGANISM

Isolation.—Small pieces of diseased fronds about ½ cm. in length were immersed for five minutes in corrosive sublimate solution (1:1000), rinsed in distilled water, and then plated in potato agar slightly acidulated with a 5 per cent. solution of lactic acid. These plates were kept in the incubator at 20° C. Within forty-eight hours mycelium began to grow out from the pieces of host

tissue. By the fourth day appressoria were abundant, and at the end of a week masses of spores formed within the surface mat of mycelium. A few such cultures were pure and from these, conidia were transferred to fresh dishes. Within one month perithecia began to form, and by the end of the seventh week the plates were literally covered with them. (Fig. 3.)

The growth of the fungus.—The fungus grows slowly on potato agar and the extension of the colony is rather limited. It grows more rapidly on corn-meal agar made up by the formula given by Shear and Wood (4). On corn-meal agar the plates were covered and perithecia formed within five weeks. When two or more colonies are growing in the same dish the mycelia do not intermingle, but check growth as the edges of the colonies approach each other, causing a surface piling up and leaving a definite margin between the colonies. (See fig. 3.)

There is no noticeable increase in the number of perithecia formed at the margins of these colonies, however.

MORPHOLOGY AND PHYSIOLOGY OF THE FUNGUS

The imperfect stage.—In the imperfect stage this fungus is of the typical *Colletotrichum* type, producing setae around the acervulus. The one-celled spores are produced abnormally in acervuli, both in culture-media and on the diseased fronds. There is a gelatinous matrix around the spores which holds them together when dry, but dissolves readily in water, permitting their spread as in the case of the anthracnose of the bean (1). The acervuli on the host are innate, erumpent, discoid, surrounded by long, black setae six to twelve in number; conidia tetrete to fusoid, 4–6½ x 12–18 μ; conidiophores rather short, straight, seldom curved, usually bluntly rounded at the tips. Germination usually begins by the formation of a septum in the conidium, followed by the protrusion of a germ tube from either the side or end. This tube usually grows a short distance and then forms an appressorium from which further growth may take place. These appressoria are subglobose, flattened on one side, and have dark-colored thick walls containing dense granular cytoplasm. Typical conidia from artificially infected fronds of the Boston fern are shown in figure 4. Setae at the edge of the acervulus are also shown.

The ascogenous stage.—The ascogenous stage has never been found upon diseased ferns by the writer. The perithecia in cultures assume a variety of forms according to whether they are produced in groups or singly (fig. 5). When produced singly they are membranous, dark-brown to almost black, with a lighter-colored beak at the apex, flask-shaped, sparingly hairy, and immersed in the medium. The asci are sessile, fusoid, 8–12 x 68–120 μ. Spores hyaline, granular, fusiform, 1-celled, and 4–6 x 13–16 μ. Paraphyses none. (See fig. 6.)

The ascospores germinate readily in a manner very similar to the conidia by producing one or more germ tubes which develop appressoria and mycelium.

NAME OF THE ORGANISM

The spore measurements for both conidia and ascospores average rather low for species of *Glomerella* as given by Shear and Wood (**4**), but are well within the limits of those given for *Glomerella cingulata.*

In order to determine whether the organism in hand would infect hosts readily attacked by *G. cingulata,* transfers from pure cultures were made in the first case to the fruit of the apple. This test was repeated eight times upon as many different varieties of apples and in no case did any infection occur.

Similar tests were also tried upon the green pods of the bean, *Phaseolus vulgaris,* and upon the fruits of the banana and cucumber, with the like result that no infection occurred. While no inoculations were made upon cotton, this fungus would seem to differ from *Glomerella gossypii,* which is described as having paraphyses.

The failure of cross-inoculation experiments, together with the growth characteristics of this organism, would seem to justify according it specific rank and it is tentatively named **Glomerella Nephrolepis** sp. nov.

RELATION OF THE FUNGUS TO THE HOST

When either ascospores or conidia germinate upon a susceptible plant of the Boston fern, they produce appressoria and in turn fine hyphae which penetrate the cuticular and subcuticular layers and

produce a vesicle from which branches arise and extend into the host tissue. The invading hyphae enter the host cells, causing their collapse. The growth of the hyphae through the young tender tissue is very rapid and can be followed by the browning of the host cells soon after attacked. The walls collapse and the lesions become conspicuous within a few days, as is well shown in figure 1.

At about the time the cankered areas form the mycelium begins to develop abundantly in the epidermal cells and those just beneath, forming a stroma of closely crowded and septate hyphae. The host cells at this time are badly disorganized and the individual cells are difficult to observe. From the pseudoparenchymatous tissue thus formed arise short conidiophores, at the apex of which are borne the bluntly rounded conidia. These are produced in such abundance that they soon rupture the cuticle and are freed. (See fig. 4.) The lesions produce the acervuli at the center first and farther out as the canker enlarges. Long, brown, 4–5-septate setae are produced around the margin of the acervulus, both on the host and in cultures. They are almost the same diameter throughout, tapering bluntly to a point at the free end. The setae are few (6–12) in number and on the host about 6 μ in diameter and 120–200 μ in length.

PROOF OF PARASITISM

From pure cultures secured as heretofore described both conidia and ascospore subcultures were made. Spores from both types of cultures were sprayed upon healthy fern plants, incubated under bell jars, and typical lesions were produced. From these lesions isolations were again made and the cycle repeated five times. In every case typical diseased fronds were produced, and cultures made from all cycles have consistently shown the same cultural characteristics.

VARIATIONS IN SUSCEPTIBILITY

In regard to differences exhibited by the various strains of the Boston fern to the attack of the fungus, Dr. Benedict, in a letter to the writer, makes the following note: "In one number, 315, this blighting affected a portion of the leaves regularly. The variety

was tested to see whether perfect leaves might be produced under the best conditions, but without success. Grown in poor conditions, almost all the leaves would stop growing when about one third the length typical for the form had been reached. None of the other sporelings tested out at the same time showed the same defect. Later, in another batch of plants of the same sowing, a similar diseased condition was noted in at least three numbers, 75–5, 75–11, 75–14. . . . All except the three numbers mentioned above made vigorous, healthy growth, but these showed the leaf-blighting both in stock cultures and in those in the pots. There are indications of occasional blighting of single leaves in other numbers, but these four above are the ones which show a continuous affected condition."

ECOLOGIC ASPECTS AND CONTROL

The spread and maintenance of the disease are fostered by a crowding of the plants on the benches and in the propagating houses, by overhead watering, where the water remains on the leaves for long periods of time, and by high humidity and temperature. Spread of the disease in the greenhouse is primarily through close planting or crowding and watering.

Tests, where slightly infected plants were pruned of all diseased leaves, the soil covered with a coating of sand and water applied only to the soil, have demonstrated that slightly susceptible forms may be rid of the disease by these measures.

The following control measures have been found effective:

1. Selection of resistant forms. Variation in susceptibility points the way to control by this means.

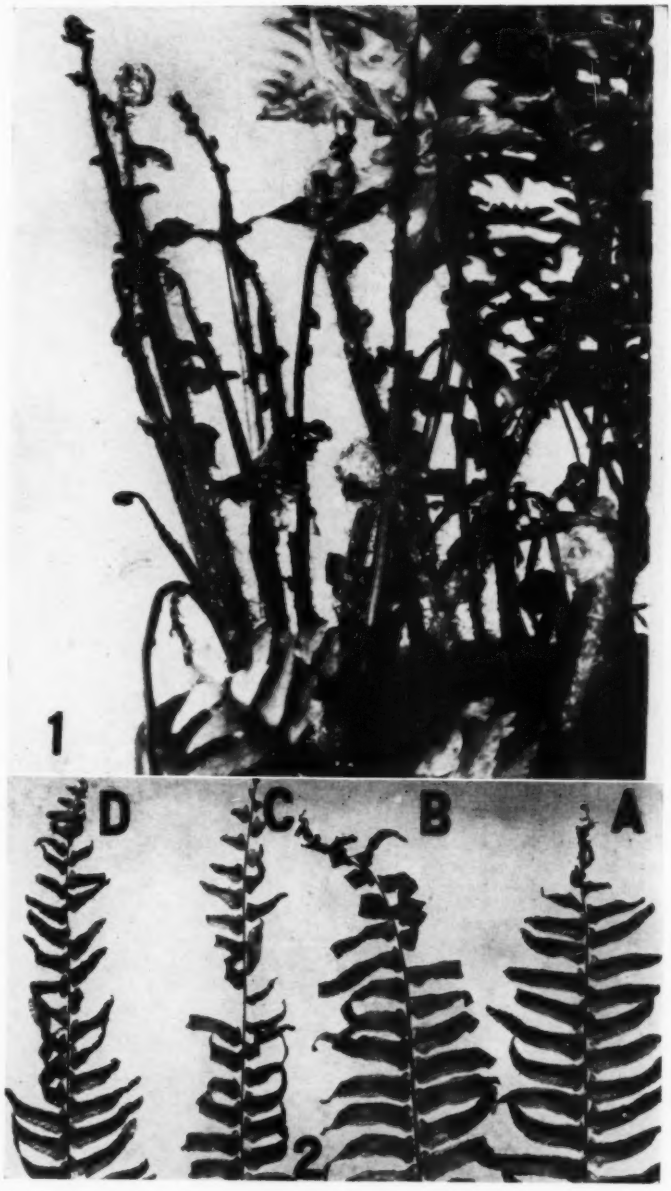
2. Proper aëration of the greenhouse to keep a low relative humidity.

3. Watering the soil in the pots and benches, care being taken to dry the leaves after washing them.

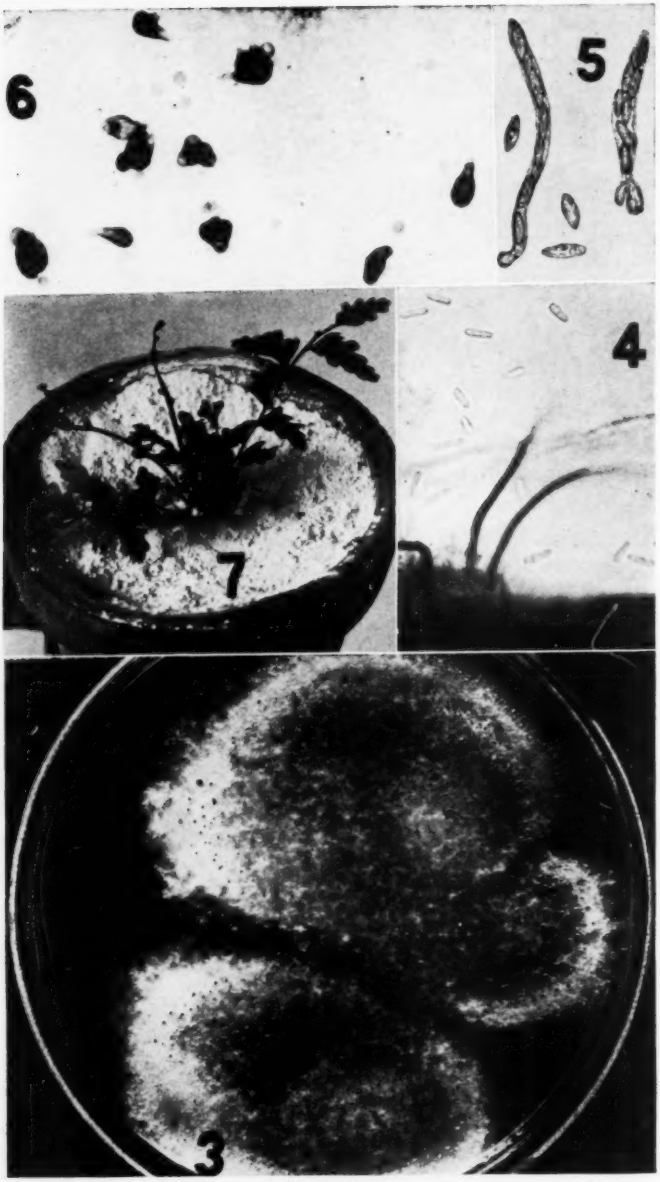
4. Removal of all infected tissue as it appears and destruction of badly diseased plants.

The writer is indebted to Dr. R. C. Benedict for an abundant supply of host material.

BROOKLYN BOTANIC GARDEN.



BOSTON FERN INOCULATED WITH GLOMERELLA NEPHROLEPSIS FARIS



CULTURES AND SPORES OF GLOMERELLA NEPHROLEPIS FARIS

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2. **Benedict, R. C.** The origin of new varieties of *Nephrolepis* by orthogenetic saltation I. Bull. Torrey Club 43: 207–234. *pl. 10–15.* 1916.
3. —— The origin of new varieties of *Nephrolepis* by orthogenetic saltation II. Am. Jour. Bot. 9: 140–157. *pl. 5–10.* 1922.
4. **Shear, C. L. & Wood, Anna K.** Studies of the fungous parasites belonging to the genus *Glomerella.* Bull. U. S. Dep. Agr. Pl. Ind. 252: 1–110. *pl. 1–17.* 1913.

EXPLANATION OF PLATES

PLATE 8

Fig. 1. Young fronds of Boston fern five days after inoculation from pure cultures of the anthracnose organism. Reduced.

Fig. 2. The tips of four fronds inoculated at varying distances from the terminal growing point. Reduced.

A. Inoculated 1 inch behind the tip.
B. Inoculated 2 inches behind the tip.
C. Inoculated 3 inches behind the tip.
D. Inoculated 4 inches behind the tip.

PLATE 9

Fig. 3. Petri dish cultures seven weeks old showing growth habits of the anthracnose fungus upon potato agar.

Fig. 4. Microphotograph of conidia and setae of the *Colletotrichum* stage.

Fig. 5. Camera lucida drawing of asci and ascospores. × 375.

Fig. 6. Microphotograph of various forms of perithecia produced in agar cultures.

Fig. 7. Typical attack on a young sporeling. Normal size.

NOTES AND BRIEF ARTICLES

[Unsigned notes are by the editor]

Dr. C. G. Lloyd called at the Garden late in August on his way to Kew Gardens, England, to examine type material in certain groups of fungi. He expects to visit France and Italy also before he returns.

Commercial plantings of China aster in New York State have been severely attacked by a new species of *Septoria*, according to W. O. Gloyer, who describes the fungus in *Phytopathology* as *S. Callistephi*.

Dr. Montemartini, of the Cryptogamic Laboratory, Pavia, Italy, writes me that Saccardo's "Sylloge Fungorum" will be continued, and that he will be glad to receive for this publication any mycological information published since 1917.

Phytopathology for May, 1922, contains a series of papers of the greatest importance on "Insects as Disseminators of Plant Diseases." Various phases of the subject are there discussed by F. V. Rand, E. D. Ball, L. Caesar, and M. W. Gardner.

Dr. James R. Weir, of the Department of Forest Pathology at Washington, D. C., spent from the middle of July to the first of September at the Garden studying the collection of polypores and comparing specimens from his large private collection with authentic material here.

It is interesting to note that it was discovered by R. H. Colley, in making tests of pieces of Sitka spruce and Douglas fir for air-

plane stock, that the effect of *Fomes pinicola, F. Laricis,* and *Polyporus Schweinitzii* on such timber was decidedly more prominent than that of *Trametes Pini.*

The fourth International Phytopathological Conference, on Truck Crop Diseases, met at Seaford, Delaware, August 28, 1922. Three days were spent in studying these diseases in the field—in Delaware, New Jersey, and Pennsylvania—and one day was devoted to inspecting the markets of Philadelphia.

A handsomely illustrated paper on the species of *Lentinus* in the region of the Great Lakes, by the late E. T. Harper, appeared in the *Trans. Wisc. Acad. Sci.* for February, 1922. *Lentinus lepideus, L. tigrinus, L. adhaerens, L. suavissimus, L. cochleatus, L. ursinus, L. vulpinus,* and their relatives are discussed at some length.

In a collection of basidiomycetes brought back from British Guiana last September by Prof. F. L. Stevens, there was a specimen of *Amauroderma subrenatum* Murrill, described and previously known only from British Honduras, where it was collected by Prof. Morton E. Peck.

E. C. Stakman and M. N. Levine have keyed the 37 known biologic forms of *Puccinia graminis Tritici* in a preliminary account of the method employed by them in determining the identity of the forms through their action on certain "differential hosts." (*Tech. Bull. Univ. Minn. Agr. Exp. Sta.* **8**: 3–10. July, 1922.)

A new disease of cotton, caused by *Ascochyta Gossipii* Sydow, is discussed by Elliott in Bulletin 178 of the Arkansas Experiment Station. This disease appeared in Arkansas in 1915 and again in 1920, both outbreaks having been preceded by unusual rainfall. It

attacks all parts of the plant above ground, including the bolls, and over-winters on the dead stalks. Rotation of crops is suggested as the most obvious remedy.

Lenzites sepiaria, L. trabea, Trametes serialis, Fomes roseus, Lentinus lepideus, and other fungi causing decay of building timbers are discussed at length by W. H. Snell in Bulletin 1053 of the U. S. Dept. of Agriculture. Studies are reported on the physiological relations of the spores and mycelium of these fungi, with characters of cultures and a key to their identification; also good illustrations and a full bibliography.

The polypores of South Africa were listed, keyed, and described by van der Bijl in the *S. A. Journal of Science* for June, 1922; *Polyporus durbanensis, P. trichiliae, P. ochroporus, P. flexilis, Trametes varians, T. griseo-lilacina, T. Keetii, T. tomentosa,* and *Daedalea Hobbsii* being described as new. The author acknowledges the coöperation of Mr. C. G. Lloyd in this work, and his name appears after a number of species not mentioned in the above list.

A very attractive illustrated bulletin on the Botrytis blight of tulips, by E. F. Hopkins, appeared as Memoir 45 of the Cornell University Experiment Station. The characters of the disease, with the morphology and physiology of *B. Tulipae,* are given in detail. The fungus hibernates on the bulbs and blights the leaves and flowers the following spring. The use of clean stock is recommended, with careful handling, good storage conditions, and the prompt destruction of all diseased plants.

Mycological notes for 1920, by L. O. Overholts in the *Torrey Bulletin* for June, 1922, include discussions and illustrations of *Zythia resinae* (Ehrenb.) Karst., *Biatorella resinae* (Fr.) Mudd., *Pilacre Petersii* B. & Br., *Tulasnella Violae* (Quél.) Boud. & Gal.,

Dacryomyces hyalina Quél., *Stereum radiatum* Peck, *Merulius fugax* Fr., *Solenia fasciculata* (Pers.) Fr., *Polyporus caeruloporus* Peck, *Fomes Bakeri* Murrill, and *Phallogaster saccatus* Morgan. *Polyporus compactus,* a resupinate species, is described as new.

Graff's fifth paper on "Philippine Basidiomycetes" appeared in the *Torrey Bulletin* for August, 1922. *Daedalea subconfragosa* Murrill is said to be synonymous with *D. lurida* Lév.; *Trametes versatilis* Berk. is transferred to *Daedalea; Inonotus Clemensiae* Murrill and *Hapalopilus subrubidus* Murrill are transferred to *Hexagonia; Auricularia reticulata* Fries is transferred to *Gloeoporus,* with *G. conchoides* Mont. as a synonym; and the new genus *Copelandia* Bres., based solely on the presence of cystidia, is reincluded in the genus *Panaeolus.*

A severe bacterial disease, which attacks all kinds of bananas in the Dutch East Indies, has been under investigation for several years by E. Gäumann, who calls it the "blood disease." It involves yellowing of the whole leaf-crown and discoloration of the fruit. Internally, the symptoms resemble those due to the so-called Javanese disease. The changes in the fruit are most specific, including a yellowing or browning of the central vascular bundles, extending even to the fruit rind. Transmission takes place from mother plants to younger plants or by way of the air, but the carrying agent has not been identified.

The cytology and life history of the fungus causing the wart disease of potato has been investigated by K. M. Curtis, of the Royal Society of London. His published treatment includes the morphology of the prosorus and sorus; the zygote; the resting sporangium; and a general discussion including the relation of fungus and host plant, the persistence of the organism in the soil from year to year, immunity from wart disease, nuclear reduction, the relation of the fungus to the genus *Pycnochytrium,* and sexu-

ality in the Synchytriaceae. A bibliography is given of about 50 titles representing widely separated regions.

An illustrated article on Philippine Edible Fungi, by O. A. Reinking, appeared in Bulletin 22 of the Philippine Bureau of Forestry, published in the summer of 1922. Species of *Auricularia, Coprinus, Agaricus, Pleurotus, Lepiota, Lycoperdon,* etc., are described and general methods of cooking discussed. It is rather surprising to find four species of *Panaeolus* included as edible. *Volvaria esculenta* Bres. is said to be the most important and common edible gill-fungus found in the Philippines. It is collected wild and is also cultivated in the abaka and rice districts on decaying trash. Its flavor is strong and agreeable and it keeps well in a dried condition.

An interesting museum object made partly of the sporophore of a bracket fungus (*Elfvingia tornata*) was presented to the Garden by Dr. Tanaka, one of the associate editors of *Mycologia,* when he passed through New York late in July on his way to Japan. The sporophore was cut and hollowed out to form a pouch for tobacco, and attached to it by a cord was a pipe-case made of veneered wood. This species of bracket fungus is as common in the Orient as the artists' sketching fungus (*Elfvingia megaloma*) is in America, and, according to Dr. Tanaka, is abundantly used for the manufacture of small boxes, trays, etc., in the prefecture of Ehime on the Shikoku Island, where the museum object mentioned above was purchased.

Mr. Perley Spaulding has summarized in a recent bulletin the extensive investigations made on blister rust of white pine, and concludes that the most practical method of control is to destroy all the Ribes within 300 yards of white pine trees. It appears that this disease is of Asiatic origin, where its original host plant is thought to have been *Pinus Cembra.* It was probably introduced into this country from Europe on young pine trees late in the nine-

teenth century. The life history of the fungus on pines and on species of Ribes is described at length, and the known and suspected host species of Pinus and Ribes are enumerated. The organism is said to over-winter on pines and under some conditions on Ribes also.

Experiments with fungi attacking paints have been conducted by C. M. Haenseler, of the N. J. Exp. Station, who reports *Dematium pullulans,* several species of *Cladosporium,* two species of *Phoma,* and an unidentified fungus causing discoloration on painted surfaces, with *Cladosporium* and *Aspergillus* causing considerable injury to varnished surfaces. These fungi were unable to derive their full nourishment from the oil in the paint, and it is believed that they obtain some of it from foreign matter which happens to be on the paint. Panel tests showed that, next to lithopone, pure white lead was the most subject to attack, while zinc oxide and mixed paints showed only occasional colonies. Antiseptics and fungicides added directly to paints were not especially effective.

A bulletin by C. O. Smith on the infection of, and resistance to, walnut blight in California states that this serious bacterial disease of the Persian walnut is probably transmitted only through the old blight lesions in which the organism remains alive during the dormant period, coming to the surface under favorable conditions. It may come to the surface of both leaf-buds and catkin-buds before spring growth begins, though the actual significance of such occurrence has not been fully established. Infection may not occur before the new growth appears in spring. Fog, dew, and late rains appear to be important agents in the spread of the disease, but insects and pollen may carry the infection to some extent.

A paper on "Slugs as Mycophagists," by Buller in the *Transactions of the British Mycological Society* for 1922, contains the following conclusions:

"The successful experiments with *Phallus impudicus, Russula heterophylla,* and *R. nigricans,* described above, clearly show that

the fruit-bodies of these fungi, under certain conditions in the open, attract *Limax maximus* from a distance of at least 10 to 21 ft.

"Having regard to the well-known short-sightedness of slugs, to the fact that slugs find their food at night, and to the sensitiveness of *Limax maximus* to mustard gas when diluted to one part in ten million, my observations and experiments led me to suppose that fungus-eating slugs react at a distance to the odors given off by fleshy fungi, and that in woods and gardens they find the fungi upon which they feed by their sense of smell."

Several members and friends of the Yama Farms Mycological Club, of which Dr. Murrill is president, spent nearly a week in the Catskills early in August studying the fungi in particular and other plants incidentally. The days were devoted to collecting and making field observations, while the evenings were given over to addresses and discussions on "Fungi," "Edible and Poisonous Mushrooms," "Wild Flowers," "Trees," etc. Invitation addresses were given by Dr. F. B. Turck on "Fundamental Biological Principles," by Mr. Edsell on "Water Power," and by Miss Phillips on "The Federated Clubs of American Working Women." Mr. H. I. Miller, chairman of the executive committee—a most genial host and efficient manager—presided at the meetings. Dr. H. D. House, State botanist and one of the officers of the club, carried back to the herbarium at Albany a number of rare and interesting specimens. Mr. John A. Kingsbury, former commissioner of charities in New York, was one of the guests and soon afterwards became an active member.

Plant nomenclature is discussed by J. H. Barnhart in the *Journal of Botany* for September, 1922. In considering the revocation of Article 36, which requires Latin diagnoses, he says in part:

Today nearly every botanist can read with little difficulty English, French, and German, and can write at least one of those languages. As far as descriptive botany is concerned, one who can read these three need have little difficulty with any other Romanic or Teutonic language, and this extends the scope of his reading to

Swedish, Norwegian, Danish, Dutch, Flemish, Portuguese, Spanish, Italian, and Latin. These two groups, the Romanic and Teutonic languages, with many words in common, and not more than two or three for any plant structure or character, include the mother-tongues of nearly all the plant taxonomists of to-day, and some one of these languages is available for literary expression to nearly every educated person whose mother-tongue lies outside of these two groups.

Perhaps this may be the appropriate place to call attention to the actual meaning of Article 36. The discussions at Vienna made it perfectly clear that when this article said "Latin diagnosis" it meant "diagnosis," not description. The supporters of this article emphasized the fact that it was expected that each author would write his *description* in the language of his choice, but must accompany this with a *diagnosis* in Latin, preferably in as few words as consistent with clarity, noting the important peculiarities of the novelty. This distinction between diagnosis and description has been almost universally ignored by those who have attempted to conform to the Rules—naturally so, as this article was printed with no explanatory annotation.

BIBLIOGRAPHIC NOTES

Saccardo, Sylloge fungorum **6**: 812

Hormomyces, Bon. Handbk. Hypsilophora Berk. & Cke. Grev. IX, p. 17.

The article in Grevillea in which *Hypsilophora* is referred to is Kalchbrenner and Cooke's South African fungi. *Hysilophora* does not appear on p. 17; but on p. 18 occurs *H. callorioides*. Under this species is the note "with the habit of *Dacrymyces*, but separated from that genus by Berkeley."

Berkeley published the genus *Hypsilophora* in a brief article in Gard. Chron. n. s., v. 11, p. 299, Mr. 8, 1879, entitled "*Hypsilophora destructor*." He says it was published in Grevillea as a species of "*Dacrymyces*," but does not agree with that genus, and goes on to propose the "name of *Hypsolophora*" with the species

Hypsilophora destructor and *H. syringicola.* From the above, as well as from Berkeley's own derivation for the generic name, it is evident that "*Hypsolophora*" is a typographical error. This spelling, however, appears in the index to the Natürlichen pflanzenfamilien, teil I, although in the text *Hypsilophora* is used.

Dacrymyces destructor and *D. syringicola* were originally described in *Berkeley's Notices of North American Fungi.* Grevillea **2**: 20. July, 1873.

Ceracea, Cragin, Saccardo, Sylloge fungorum **6**: 80.

This genus was described by Cragin in the *Bulletin of the Washburn Laboratory of Natural History,* v. 1, p. 82, Jan., 1885. It was noticed in the literature lists of the *Journ. Mycol.,* v. 1, p. 58, Ap., 1885.

Saccardo gives the title of Cragin's article and the page reference, but not the title of the publication in which it appeared; he also gives the *Journal of Mycology* reference, which has been taken by some writers as the original place of publication.

Just's Botanischer Jahresbericht. 1881

In trying to discover whether Patouillard published the genus *Sphaerula* previous to his Tabulae analyticae, 1883, I ran across *Sphaerula* in the index to Just's Bot. Jahresb. for 1881. The page reference was to the list of new species of fungi and here appeared *Sphaerula sagedioides* Winter on *Daucus carota.* This in turn referred to the referat in vol. 1 of 1881, p. 238 (I have not traced all the steps, as at this time the method used in Just was extremely complicated). The referat consisted merely of the title: Kunze, J. Fungi helvetici exsiccati, Cent. III–VI, and referred to a review in Oesterr. Bot. Zeitschr. 1880, p. 67. In the latter the species listed is *Sphaerella sagedioides* Winter and there is no *Sphaerula,* so that the reference in the index of Just and in the list of new species is a typographical error.

Lindau & Sydow, Thesaurus litteraturae mycologicae

On v. 1, p. 341, is listed: Dalman, Olaus. De fungis suecicis (Act. Holm. 1811, p. 157) "Act. Holm" is the abbreviation generally used for the series of the "Svenska vetenskaps-akademien

handlingar, and page 157 of 1811 is in Swartz's "Svamparter saknade i Flora Suec.," where reference is made to J. W. Dalman. This Dalman was an entomologist, and though evidently interested in fungi, I have not been able as yet to locate anything that he wrote on the subject. As to Olaus Dalman, I have not discovered that any such person existed. If any of the readers of *Mycologia* know to what this entry in Lindau & Sydow refers, I should be very grateful for the information.

ALICE C. ATWOOD

PORIA COCOS (SCHW.) F. A. WOLF

On June 14, 1915, I received from Mr. Edgar Nelson, who was then at Lebring, Florida, a large fresh specimen of tuckahoe encircling the root of a Eucalyptus tree which had recently died. On June 29 I wrote to Mr. Nelson as follows:

"I have your letter of June 23 regarding the habitat of the specimens recently sent me. I do not think the fungus caused the death of the Eucalyptus trees. It is found occurring on dead or decaying roots. Mr. M. E. Brown nearly twenty years ago found a number of these same sclerotia at Winter Park, Fla., and they were always attached to roots. What I should like to have you do would be to find some of the sporophores arising from the mycelial masses. If you could collect a number of them and plant them where they could be observed, I think you would have no difficulty in finally securing the desired results. This was done in Canada some years ago and a specimen of polypore (*Scutiger*) was obtained. If any of the fruit bodies are found, do not attempt to send them to me in the fresh state, but dry them first, taking careful notes on color.

"The largest specimen you sent developed a *Poria*. This may have arisen from the dead wood as a separate thing, but it is well to look out for another yellowish *Poria* found associated with the sclerotia. Since Florida is said to be full of these interesting bodies, I am sure you ought to have considerable success, especially if you will give the subject some newspaper prominence and solicit coöperation."

Mr. C. E. Pleas, of Chipley, Florida, who claimed to have examined hundreds of specimens, said that they always occurred on dead roots, and that they were found mature at all seasons of the year. He mentions hickory as the host. R. J. Mendenhall states that there used to be many of them in North Carolina before the stumps disappeared. I tried to secure more specimens through Mr. Nelson, but failed; about that time the whole world became upset.

A paper by F. A. Wolf in the September number of the *Journal of the Elisha Mitchell Scientific Society* is of peculiar interest to me because he has carried out the study which I had in mind; although a good deal remains to be done by observations over a wide field before our knowledge of the southern tuckahoe is complete. Mr. Wolf's figures show exactly the same *Poria* that appeared on the specimen received from Mr. Nelson; so we may at once extend the range of hosts beyond "pine only."

Mr. Wolf's excellent paper includes an account of the history, structure, and origin of the southern tuckahoe; with the development and morphology of the fruiting stage, as observed after 175 years, upon sclerotia apparently parasitic on the roots of pine. Mature sporophores of the *Poria* type were secured by him on the surface of six different tuckahoes, and were also developed in cultures from tissue taken from central portions of large sclerotia.

W. A. MURRILL